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LONDON, MAY 13, 1960

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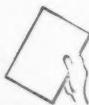
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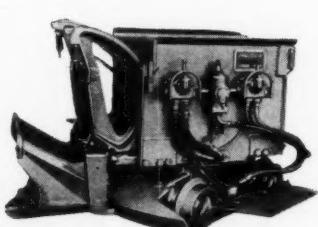
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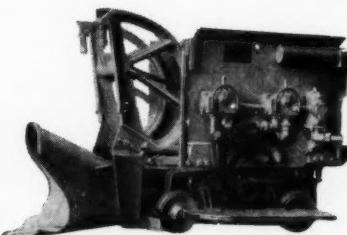
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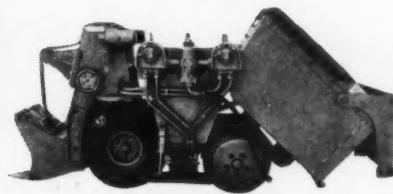
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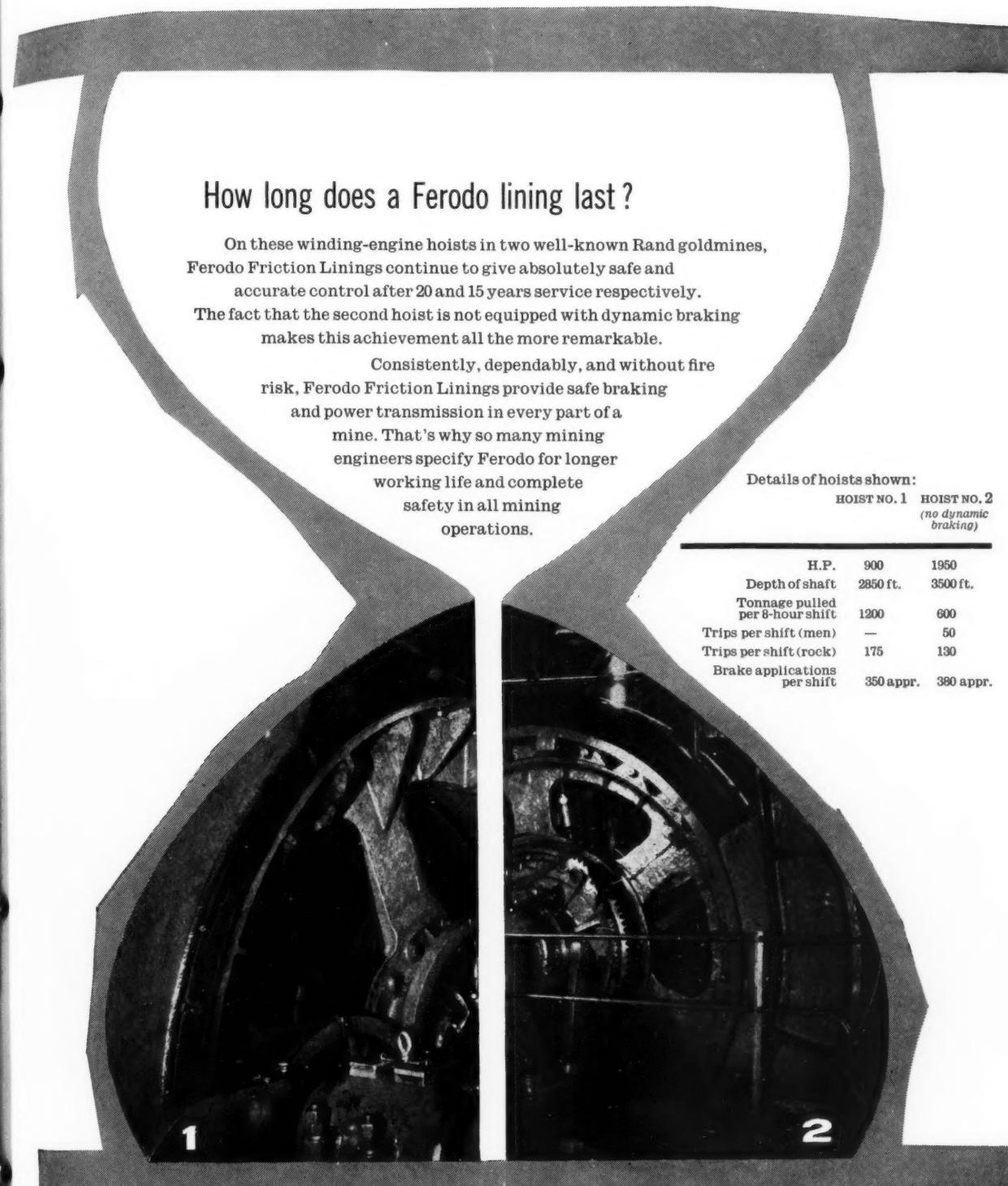
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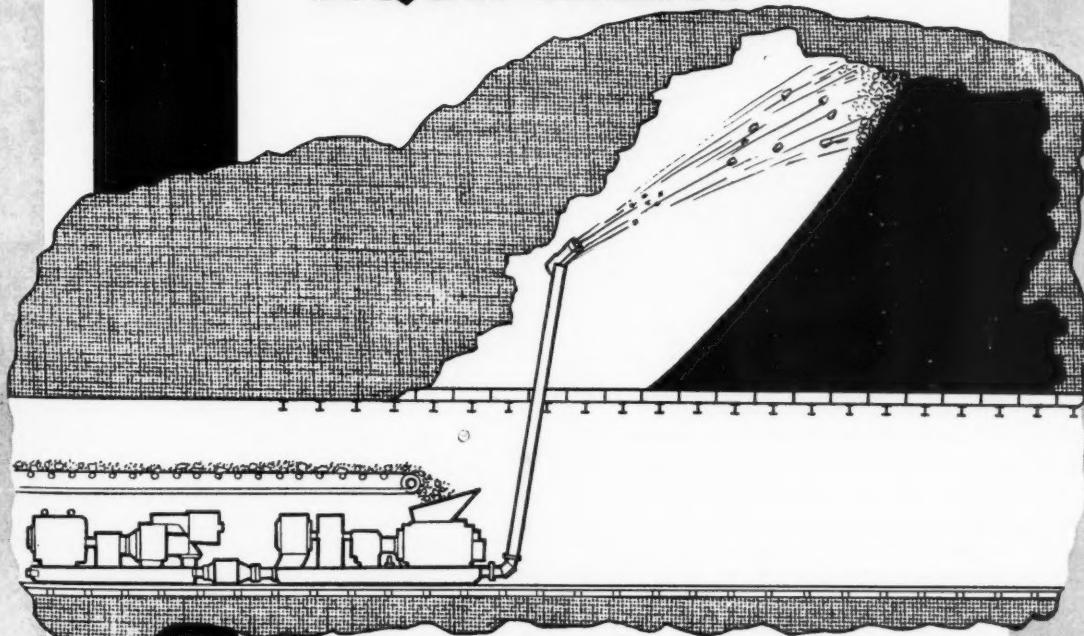
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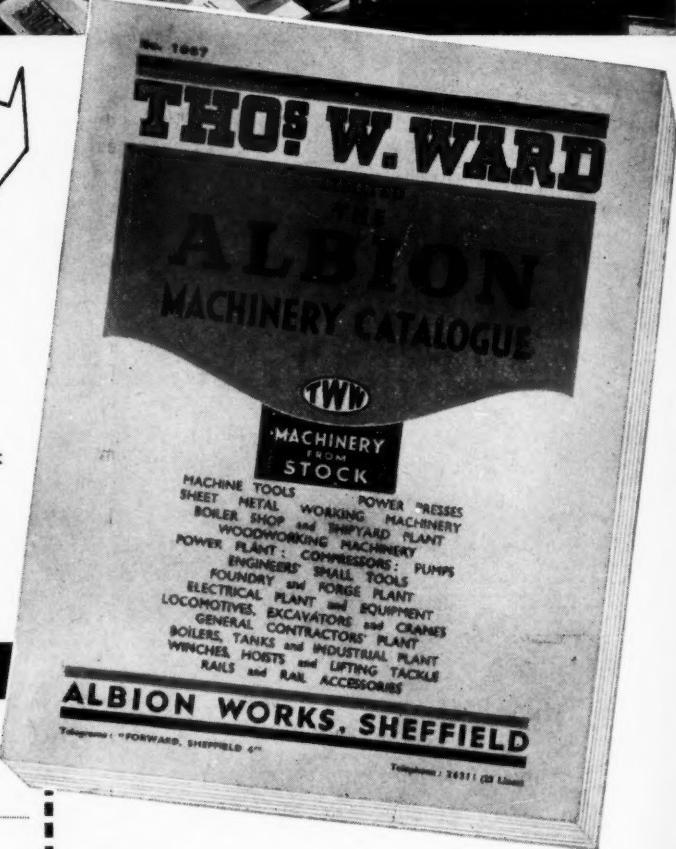
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The Mining Journal

London, May 13, 1960

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India Seeks "Know-How"

INDUSTRIAL production depends decisively on fuel and power and if living standards are to rise so then must the availability of adequate primary energy be assured. In India, as with most Eastern countries, it is coal production which holds the key to the problem of maintaining steady industrial expansion, but unfortunately for India the increase in coal output envisaged under the initial Five Year Plans has not been forthcoming. In fact the Indian coal industry has the doubtful distinction of having the lowest output per manshift of any major producer for which figures are available. One does not have to look far to find the reasons for this state of affairs. In our issue of April 1 this year, it was pointed out that lack of capital is effectively stifling the industry, and the need was urged for closer co-operation between the Indian Government and Western mining machinery manufacturers. Machinery of itself, however, cannot make an inefficient industry into an efficient one. This can only be done by a working combination of good mining engineers, suitable equipment and capable miners. If the Indian coal industry is to make any material progress, considerable work must be done on each of these individual problems.

With regard to the provision of good mining engineers, one can appreciate India's desire to produce her own managers and engineers but education and training facilities cannot be tripled and quadrupled overnight. At the Indian School of Mines in Dhanbad numbers have been abruptly boosted to 90 mining students a year without commensurate increases in staff and facilities. It would be surprising, therefore, if standards, previously considered suitable, were maintained following an expansion of this order. Again, with the large-scale exodus of European mining engineers from India, it is possible that Indian graduates have achieved managerial and professional status much too quickly and without the essential foundation of several years practical experience.

Belatedly realising the need for more technical assistance, the Indian Government has invited Britain, and also, we believe, U.S.A., Germany, France and Russia with a request for technical consulting teams to go to India on five years' contracts. The British N.C.B. has expressed a readiness to send a *preliminary team of 3 or 4 mining engineers as well as opencast mining experts and coal preparation and workshop engineers*. The N.C.B. does not want to commit itself to long term contracts at this stage and has recently suggested that this preliminary team be sent out purely as an investigation group for a few months only.

What causes us some anxiety over this latest and possibly last opportunity for injecting British know-how and in due course, let it be hoped, British mining equipment into the Indian coal industry on any major scale, is that to seize this opportunity will call for the same energetic approach, which we can safely assume is being displayed by the other countries who will be offering their services.

On the basis of past experience, there is some danger that the Commonwealth Relations Office may resent being made a party to what amounts to an international auction of technical aid, and may

consequently not be inclined to attach as much urgency to the matter as it deserves, or to ensure that the best available men are sent out by the N.C.B. and, moreover, that they go out as a co-ordinated team and not as individual specialists.

As other British consultants have found before, tackling coal mining problems under different social and economic conditions from those which obtain in England can fundamentally alter the nature of these problems and it is therefore essential that the N.C.B. should include in its party people who are already familiar with Indian conditions.

So far Indian reaction to this plan has not been communicated to the Board but if, in fact, British consulting teams do go to India the N.C.B. must not use this potential labour market only as a sponge to soak up staff considered redundant because of the contraction of the British mining industry. Consultants must always be the cream of any profession, and British mining consultants have traditionally enjoyed a reputation second to none—a reputation built up over many years by sheer ability and hard work.

PRIMARY COPPER IN TIMNA ?

A team of geologists, led by Professor Y. Benter, professor of petrography and mineralogy at the Hebrew University, Jerusalem and director of the Israeli geological survey, have been conducting a field study, using geo-chemical methods, in the vicinity of Timna. This project was commissioned by Israel Mining Industries, the development company operating Timna Copper Works. Certain geological features in the Timna area of the Negev are typical of those obtaining in many parts of the world, indicating primary copper deposits at depth.

The secondary (sediment) ores, which have already earned profits for the country, were discovered in 1950 by Professor Benter. Earlier proven Timna deposits were estimated at about 17-18,000,000 tons of ore of an average copper content of 1.4 per cent.

The primary copper ore would be of a higher concentration than the secondary ores which derive from it, and new sources would be commercially exploitable at a depth of up to 200 metres. Although the finds are regarded as encouraging, further investigation by core test drills will be needed before their economic significance can be ascertained.

GROWTH OF ROUMANIA'S FERROUS METAL INDUSTRY

Roumania is still first and foremost an oil country. Last year's oil production, which bore an output index of 193.2 (1938 : 100) as against the 1958 index of 171.5—representing an output of 11,300,000 tonnes—proved that the industry is growing well, and plans for the future with their pipeline and petrochemical projects indicate an even further growth. Nevertheless, the Roumanian industrial economy is becoming rapidly far less one-sided. The governing authorities, like those of other Eastern European states, are working for a healthy machine-building industry, directed particularly at the production of oilfield and chemical equipment, and the country's metals production is being forced up hard as a result. In 1959, when Roumanian industrial output as a whole went up by rather over 11 per cent, output of raw steel, so important for the industrial build-up, went up by as much as 52 per cent.

How natural this growth of the ferrous metals industry is can be seen by the recent appeal to the public by the country's government for the remarkable figure of 900,000 tonnes of scrap iron. If this volume is not collected, it is stated, the 1960 production target of 1,700,000 tonnes of raw steel will not be attained. Last year, some 700,000 tonnes of such scrap needed to be collected from the public for the manufacture of an estimated 1,400,000 tonnes of steel. However, the expansion in iron and steel is not for explaining away. The increase in steel production in 1959 over 1958, already quoted, was much higher than that aimed at by the Government—one of 39.5 per cent. In 1958 itself output of pig iron in Roumania was 396 per cent the 1938 figure, that of raw steel 264 per cent and that of rolled steel 248 per cent, while production of iron ore was 534 per cent the level reached twenty years before. Current estimates put the combined 1959 production of the Roumanian machine-building and metal-processing industry at 14 per cent above that for the previous year, which was itself 750 per cent more than that for 1938.

New developments include the discovery of further iron ore and manganese ore deposits—production of the latter item has risen by 334 per cent in the past twenty years—the bringing into production of two large-capacity blast furnaces at Hunedoara steelworks and of a sinter plant with an annual capacity of 1,000,000 tonnes of iron ore, a new Siemens-Martin steelworks with 185-tonne furnaces, a bloom rolling mill with a 960,000-tonne per-year capacity, a 500,000 annual-tonnes rolling mill for medium and thick profiles, the building of south-east Europe's biggest tube rolling plant at Roman and further extensions to steelworks at Resita, Galati, Calan and elsewhere. With this expansion of the ferrous metals industry—which still depends mainly on Russian ore and coal-metallurgical coke output, now 700 per cent above pre-war levels, will also continue to grow.

The ferrous metals industry is, then, on the way to becoming a good second to the oil industry in Roumania's economy. The recent discovery of new coal veins will aid this development, while Roumania's ore reserves already allow her to indulge in a modest export trade through the foreign marketing board Petrolexport. The production of other metals and minerals takes up only a minor place in the national economy, and only figures for refined aluminium have been given any sort of publicity as far as 1959 production is concerned; this, it is stated, remained at the 1958 level of about 10,000 tonnes, while plans for the period up to 1970 showed no signs of expanding aluminium production capacity.

AMERICA LOOKS FOR MINING ENGINEERS

It is considered in the technical Press of the United States that in view of declining college enrolments in the face of growing needs for engineering talents, a new industrial programme instituted in Pennsylvania can be regarded as a major step forward. Under the scheme, boys selected by the University Department of Mining or by co-operating companies can get a degree in 5 years. The first four years are evenly divided between working for the sponsoring companies and attending school. The fifth year is completely spent at school.

Several highly successful schools operate on this basic principle, though Penn State is the first to deal with an education in mining. The problem of financing education is eased and school becomes more meaningful as a result of practical working experience.

Russian Aluminium Production

IN a study of Soviet aluminium production undertaken for *The American Metal Market*, Theodore Shahbad states that, under the current Seven-Year Plan which ends in 1965, the Soviet Union plans to increase aluminium production capacity by 150 per cent to 1,400,000—1,500,000 tonnes a year. This would compare with an American annual production capacity of 3,202,000 tonnes in 1959.

Reduction Plants

According to the Shahbad report, Russia began operating its new Stalingrad reduction plant during 1959 and, when completed in 1960, this will be the Soviet Union's largest aluminium facility with a projected capacity of about 200,000 tonnes a year. Placed in production in January 1959 with a capacity of about 40,000 tonnes of primary metal a year, the first stage of this new plant draws power from the first three units of the Stalingrad hydro-electric station. This potential was doubled in October.

According to the present known plans, the Eastern areas of the Soviet Union (which includes the Urals, Siberia and Kazakhstan) are expected to produce about 71 per cent (or about 1,000,000 tonnes) of the country's aluminium by 1965. As well as from the Ural plants and the small Stalinsk plant, the proposed expansion is expected from three 300,000-tonne plants now under construction at Pavlodar, Krasnoyarsk and Irkutsk.

Arkalyk bauxite will be processed at Pavlodar where completion, after delay, is now scheduled for 1963. Krasnoyarsk will probably obtain its alumina from nephelite ore to be processed at Achinsk. Power will not be available for aluminium production before 1964. Scheduled for completion in 1958, but still under construction in 1959, the Irkutsk plant will also use similar Achinsk-produced alumina, but some of the needed power will not be available before 1961.

In 1959, the construction of a second section of the Nadvoitsy aluminium works was begun. It is scheduled for completion in 1960 and is designed to double the plant's capacity. Power is already available.

The only expansion reported from southern European Russia is in respect of the Sumgait works, where production was doubled from 1955 to 1958 and is expected to be doubled again with a projected capacity of 40/50,000 tonnes by 1960.

From collected evidence it is indicated that the two Ural plants (Kamensk and Krasnoturinsk) which in 1950 accounted for about two-thirds of Soviet production, doubled their output between 1950-55, but produced only 40 per cent of the national total as other plants came into operation.

Modernization of production is thought to have kept pace with the build-up of the Soviet aluminium industry and the potlines of the new facilities are expected to use current as high as 130,000 amperes.

Because of continued dependence on imports for a considerable amount of good grade bauxite, transportation problems and the difficulty of processing lower grade ores, raw materials represent more than one-third of production costs while labour represents less than 10 per cent of the total. The percentage cost structure is estimated as:— alumina, 35 to 40; power 15 to 30; electrodes 9 to 11; labour 6 to 9; fluoride salts, 4 to 6; overheads, etc., 13 to 20.

Though Severouralsk in the northern Urals remained chief bauxite producer, output there probably only increased

by 34 per cent during the Fourth Five-Year Plan and doubled during the Fifth Plan (1951-55). This bauxite is the highest grade in Russia, averaging alumina 49-59 per cent; silica 3-7 per cent, but is not easily soluble by the Bayer process. Surface reserves are limited and underground mining is handicapped by flooding. Outside the Urals, the Boksitogorsk mine near Leningrad supplies 47.7 per cent alumina, 13.2 per cent silica ore of which more than three tonnes are required to yield one tonne alumina. The only reported bauxite mining project now under development at Arkalyk near Turgai will supply ore to Pavlodar.

Little new has been reported in beneficiation of nephelite concentrate. The Siberian nephelite development at Goryachegorsk is due to begin operation in 1960/61, though plans have been complicated by the discovery of a richer deposit at Lokhmataya, where the alumina content is reported at 25 per cent, compared with 22½ per cent at Goryachegorsk.

Soviet Russia still imports more than 400,000 tonnes a year of high-grade bauxite, but now from Greece instead of Hungary, which began to supply East Germany and Czechoslovakia in 1955.

Alumina Production

Estimated Soviet alumina production is 900,000 tonnes of which the Krasnoturinsk and Kamensk plants each refine about 300,000 tonnes annually. These supply Stalinsk, Sumgait and Yerevan as well as their own aluminium departments. Kamensk has adapted the Bayer process to the Severouralsk ore by treating it in combination with the more easily processed Kamensk bauxite. Alumina output was tripled during the war and almost doubled in 1950-55. Krasnoturinsk, hitherto producing 10,000 tonnes a year by the lime-soda sinter method, has since added a Bayer department, expanding its sintering operations and processing ore by the combined process.

Construction was apparently continued on the Pikalevo plant near Boksitogorsk, though the nephelite processed there will probably have to be transported considerable distances. Construction also continues on the Achinsk plant, keystone of the Siberian nephelite project, and when completed in the 1960s it will have a capacity of 800,000 tonnes a year. Here again transportation of equipment, including large French rotary furnaces, presents a problem.

The Kirovabad plant for processing alumina from alunites is due for completion in 1962. This will also yield by-products such as sulphuric acid and chemical fertilizer. A plant at Razdan, Armenia, is included under the Seven-Year Plan, but has not been reported as started.

Up to 1955, about 45 per cent of Russia's alumina was produced by the Bayer process, 30 per cent by the combined Bayer-sinter method, 20 per cent by the lime-soda sinter process and 5 per cent by the nephelite-lime process. Available data indicates the two former as the lowest unit cost methods and the latter as the highest, though by-product production compensates to some extent.

The alumina cost structure at the two large Urals plants breaks down as to bauxite 35 per cent, caustic soda and/or soda ash 10-25 per cent, steam 20-25 per cent, wages 3-4 per cent, other costs 17-26 per cent. With the exception of the cost of sodas, the higher percentage in costs applies to the combination Bayer-sintering method as against the Bayer method alone.

Ore Handling at Lobito

TO handle the growing exports of iron ore, manganese ores and smaller quantities of zinc concentrates now being shipped through the port of Lobito, Portuguese West Africa, a modern plant has recently been installed there by the British firm of Spencer (Melksham) Ltd. of Melksham, Wilts.

Mineral production in Central Africa and Angola has increased considerably in recent years and much of the ore is shipped via the 837-mile long Benguela Railway and through the South Atlantic port of Lobito. For instance, the Belgian Congo produces over 350,000 tonnes of manganese ore and exports over 300,000 tons of it. Southern Rhodesia produces about 159,000 tons of iron ore and Northern Rhodesia about 44,000 tons of manganese ore, while mineral development in Angola has been increasing rapidly over the past few years. Iron ore exports from Angola alone to West Germany and Italy are now running at about 100,000 tons a year and are expected to become much higher in the near future, the greater part being produced by Companhia Mineira de Lobito, one of the largest mining concerns in Angola.

Capable of handling 400 tons of ore an hour, the new handling installation at Lobito has been built as part of a long-term development of the port and will increase the handling capacity of the port from 2,000,000 tonnes to about 3,500,000 tons a year.

To make the storage area and, at the same time, provide the necessary depth of water for vessels moored at the quay, ground was reclaimed by dredged sand from the sea bed. Substantial reinforced concrete foundations were provided under the rail tracks carrying the handling equipment and special arrangements had to be made to drain the area adjacent to the deep excavations.

At Lobito, the storage area is arranged to accommodate eight piles of different ores and is sited well back from the quay. The handling plant consists of a section for unloading incoming railway wagons, one for storage and one for out-loading to ships.

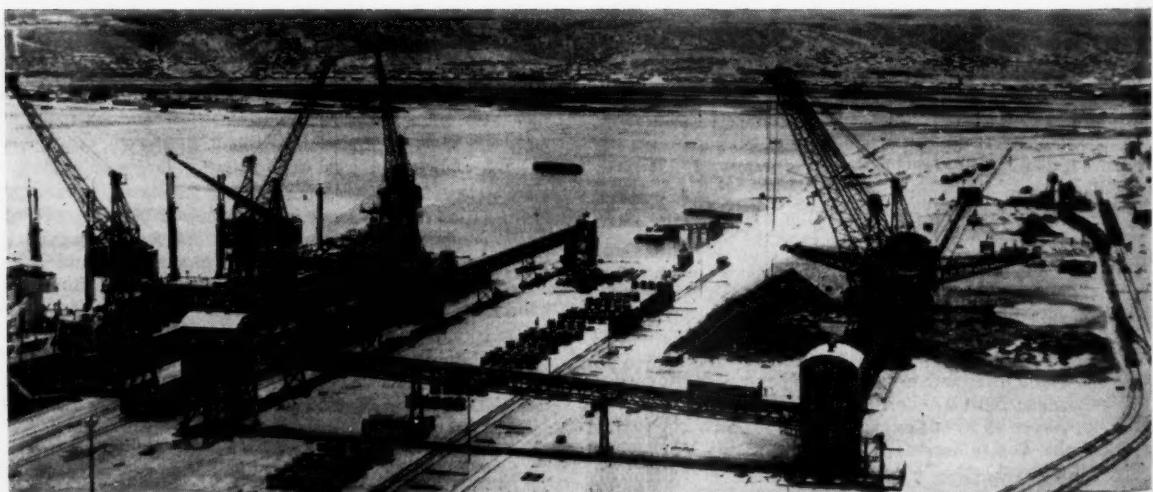
Incoming ore is brought to the port in bogie wagons of up to 41 tons capacity, some of which are fitted with a brake

cab. On arrival at the new handling plant the wagons are overturned by a tippler device specially designed to take wagons with a brake cab, the ore falling into a concrete hopper suitably lined to minimize any damage that might otherwise be sustained as a result of the impact with the ore.

Capable of dealing with the heaviest wagon with an assumed gross weight of 60,000 kg. (about 59 tons), made up of 18,600 kg. (about 18 tons) tare and 42,000 kg. (about 41 tons) payload and with a maximum wagon body length of 13.85 m. (45 ft. 6 in.) and width of 2.42 m. (8 ft.), the tippler can handle 10 wagons per hour, the average content of the wagons being 24 tons. The complete unloading cycle takes six minutes per wagon, including one minute for changing wagons. A long twin-armed cradle, fitted with trunnions fixed on a low concrete wall forming the ends of the hopper, carries a pivoted rail table. About 52 ft. long between centres, the cradle arms are lifted and rotated by means of two steel wire ropes carried over head pulleys on a steel overhead framework and operated by means of a reversible winding gear fixed to the foundations at the back of the tippler. A series of retaining beams, spaced at intervals to support its body, hold the wagon in its overturned position.

Operating the winch is a 90 b.h.p. slip-ring motor equipped with an electro-hydraulic automatic post brake, which will hold the cradle in any position, and a totally enclosed oil-bath worm reduction gear. This is followed by two sets of machine-cut spur gears in oil-bath steel gear cases with countershafts carried in self-aligning bronze alloy bushed pedestals driving a 4 ft. diameter cast-iron machine-grooved winding drum and screw-driven limit switch.

The concrete hopper into which the ore from the tippler-inverted wagons falls consists of two sections, each of whose elongated outlets is provided with a plate feeder by way of which the ore is fed to a short conveyor, 98 ft. 6 in. long between centres. This conveyor travels on an incline from the hopper pit to the end of a 994 ft. long belt conveyor which serves the storage area. Incorporating 2,064 ft. of belting, all told, this conveyor is the longest at the plant. Transversely bridging the conveyor is a double-winged travelling stacker which is fed with material by the main store conveyor and



which travels longitudinally up and down the main conveyor dropping the ore into heaps on either side, each wing having an outreach of 58 ft. Ore is delivered to the stockpiles at a rate of 240 tons an hour.

This wing tripper, whose wheels travel on tracks running longitudinally with the conveyor it serves, has a reversible transverse belt extending into the wings of the unit and is built up of rolled steel sections braced to form a portal frame for spanning the main conveyor. Cantilevered braced steel frame wings on either side, at right angles to the main store conveyor, support the reversible belt and its mechanisms. The unit is carried on two driven bogies.

Four pulleys, including the head terminal are provided for the deflection of the store conveyor belt, cage pulleys assisting in keeping the belt clean. The head terminal pulley is provided with a delivery hood and adjustable rubber sealing strips for feeding direct to the wing conveyor belt.

Reclamation of Stockpiled Material

Material can be reclaimed from the storage heaps at a rate of 400 tons per hour by two travelling grab cranes, which, together with a receiving hopper are also placed astride the main store conveyor belt between the wing tripper and its delivery end. These also travel longitudinally up and down the length of the main conveyor and the intake of ore into the store can be carried out at the same time as the grab cranes are reclaiming material from different stockpiles. The reclaimed material is delivered by the grab cranes into the travelling hopper which is rail-mounted between the two cranes and is shunted into correct position by them. Thence, by way of a plate feeder and a cushioning arrangement to reduce the severity of the impact of the falling ore, the material is re-delivered on to the main stores belt.

Each of the 10-ton portable electric grab cranes is fitted with level luffing gear and crank-operated balanced jibs, the motions of hoisting, luffing, travelling and slewing being operated by separate motors. The trucks on which the cranes travel astride the store conveyor are mounted on eight flanged rail wheels, two under each corner, in compensating carriages, while the revolving superstructure of each crane is carried on a live ring of steel tapered rollers. The hoisting gears are of the twin winch type, one holding and one closing, each with its own motor.

Each of the 1.9/1.55 m³ (67/54 cu. ft.), four-rope grabs has jaws fitted with manganese teeth and the cranes have an hourly capacity of 240 tons when the grab is filled at every lift and on the basis of an average cycle consisting of closing grab, hoisting 3 m., luffing 12 m., slewing .25 rev., discharge and return. With a 10-ton load the crane operating speeds are: hoisting 46 m. per min., slewing 1 r.p.m., luffing 36 m. per min., and travelling 12 m. per min.

Since the cranes are fitted with crank luffing gear, no ropes are required for holding the jib, this being balanced and in a state of equilibrium at all radii and under all conditions from no load to maximum load. Of timber construction, the cabin has louvres for ventilation and a double roof to provide insulation from the sun's heat. All the controllers and levers are conveniently placed and the ore operator has a good view of the load and the work area. Master controllers are provided for the close and hold motors for the grab and are coupled to unilever gear giving control of both motors on a single handle.

Material from the store conveyor is fed to another 215 ft. long conveyor which is inclined and at right angles to the former. This conveyor is combined with a continuous weigher and the whole is carried on braced steel girders supported by a junction tower at each end and two intermediate supporting trestles.

This equipment is followed by a 500 ft. long quayside

conveyor equipped with a travelling throw-off, the whole being carried by six spans of braced steel girders supported by a junction tower at each end and five intermediate trestles.

Providing for the final delivery of the ore¹ into the ships' holds is an outloader on the quayside which consists of a 400 tons per hour, 65 ft. loading-out conveyor carried in a hinged boom supported and adjusted by steel wire ropes from a tower incorporated with a steel-framed portal structure. The unit travels on two steel track rails arranged at 8.5 m. (28 ft.) centres along the quay surface. The boom can be adjusted to suit the requirements of the vessels to be loaded and can be housed to give vertical clearance above the quay edge, thereby permitting the passage of cranes as required. It can be moved from its lowest to its housed position in about 5½ min.

The outloader receives its feed from the movable throw-off fitted to the quayside conveyor, the outloader and the throw-off being directly coupled to ensure that the two travel together. A short feeder conveyor is used to minimize belt damage from falling lump material or choking that might occur through sluggish material holding up in a long chute. The outloader is motivated by two 7½ h.p. synchronous motors each fitted with a solenoid brake and driving a two-rail wheeled bogie through spur and worm gears.

Conveyor Belts

All the conveyor belts used at the new Lobito ore handling plant are of rubber and canvas, 42 in. wide and 7-ply thick. They are carried on 5-roll cast iron troughing idlers running in ball bearings arranged at about 4 ft. pitch. At the feed points, rubber disc impact idlers are provided to minimize any damage that may be sustained through falling lumps of ore. The return idlers are of the horizontal spaced type. Each is made up of a number of narrow cast iron rollers spaced apart on a steel spindle turned down on the ends for running in two self-aligning ball bearing brackets bolted to the underside of the stringers at about 12 ft. pitch.

Apart from a small percentage variation, the belts are arranged to run at an approximate speed of 265 ft./min. The stringers are of rolled steel sections in either angles or channels with sheet steel plating for bolting across the tops to protect the return belt. The terminal pulleys are of cast iron, turned on the outside, mounted on steel shafts running in self-aligning ball bearings. The drives from the respective motors are transmitted through worm and machine-cut spur gearing, the worm gears being enclosed in cast iron cases to run on ball or roller bearings in an oil bath.

The tightening gears for the conveyor belts are of the drop weight type for the long conveyors and of the screw adjustment type for the shorter. The junction terminal shoots are provided with easily removed grids to break the fall of the abrasive lump material. The feeder conveyors under the crane grabs are of the pressed-steel apron type. The apron plates are of ¼ in. steel plating pressed to form overlapping knuckles bolted to chains at intervals of 4 in. pitch.

Of two strands, bushed and formed of malleable iron links fitted with removable hardened steel pins and bushes, the chains are made up of links, each in the form of a "K" type attachment for bolting to the apron plates. On the top, carrying side, the chains run on cast iron rollers mounted in sets of three at about 9 in. pitch. On the under, return side, similar but more widely spaced rollers are provided, steel deck plating being provided between the strands. The drive from the motor is transmitted through worm and spur gear to the terminal shaft on which are mounted two cast-steel sprockets suitable for driving the steel bushed chain.

The writer is indebted to Spencer (Melksham) Ltd., for material about the handling equipment from which this article has been prepared.

Experience in Compressed-air Blasting

THE siting of the compressor is important in the installation of compressed-air blasting equipment. In order to secure the most economic operation, the compressor should be so sited that it can cater for the maximum possible output over as long a period as possible without the need for resiting. The compressor is, in fact, effective over quite considerable distances, there being already an instance in the United Kingdom of 600 tons per day being produced from faces more than two miles from the compressor.

The ventilation of the compressor engine-house is important. In an underground engine-house it would appear from present evidence that for continuous full load operation a ventilating current of 10,000 cu. ft./min. per compressor, as free from dust as practicable, is necessary. High temperatures have occasionally been recorded in surface compressor houses, and additional ventilation, in addition to the compressor fans, may also be necessary in some cases. The site of surface engine-houses for air blasting compressors should also be as free from dust as practicable.

The choice between surface and underground siting of compressors depends largely on the colliery layout. A surface installation is better placed for inspection and maintenance, and is easier to ventilate. If all working boundaries are within about two miles of the shaft-top, a surface installation would normally be preferable.

Where workings are more extensive, an attempt should be made to find a site within two miles of the boundary, bearing in mind the need for ventilation, freedom from dust, and accessibility to sufficient face room to give an economic output.

Where more than one compressor is installed they should if possible be connected to a common main, in order to share the load and to minimize the effects of failure of one compressor. In cases where only one compressor is in use, consideration must be given to the action to be taken in the event of its occasional failure, e.g. reversion to the use of explosives or alternatives. Where the output concerned is substantial, the installation of a second compressor is a very desirable safeguard. In this connection the economics of a portable compressor for several adjacent mines, each having a shaft main, should be examined.

This information is based upon the findings of a Working Party created by the National Coal Board in 1958 to review the experience in compressed-air blasting throughout the industry and to identify particular problems of safety, output, supervision and maintenance encountered during actual operations. The principal factors which have been found by experience to govern the use of air-blasting are set out by the National Coal Board in its Information Bulletin No.

60/215

Airblasting Shells¹

Shells for airblasting are available in several diameters. Experience in the Board so far has been limited to Armstrong shear-pin (or piston) type shells of 2½ in. dia. and shear-plate type shells of 2½ in. and 2 in. dia., and to Airdox shear-strip type shells of 2½ in. dia.

The early airbreaker installations included 2½ in. dia. pin-type shells, and these are still used in a number of cases, but the 2 in. dia. shear plate shell has proved to be more popular, and is now widely used. The shear-plate shell contains no moving part, and therefore requires no lubrication, and its smaller diameter reduces the drilling problem. It is also less costly than the shear-pin shell of the same dimensions.

Experience in the use of shells of the same diameter but of different types will not be obtained until the 2½ in. dia. shear-plate type becomes available. Unless it is found that the piston type shell is more efficient than the shear-plate type, all advantages lie with the latter. The present usage of 2½ in. dia. pin-type shells is due entirely to the need for the greater diameter for use in particularly hard seams of coal.

Although the shells originally supplied from America were over 9 ft. long, 7 ft. is the maximum length now found to be necessary in this country.

Shells of 2 in. dia. and 5 ft. overall length are now widely used. The shortest shells in operation are 2½ in. dia. × 2 ft. 9 in. overall length at Allerton Bywater Colliery and 2 in. dia. × 4 ft. long at Prince of Wales Colliery. In both cases these are used for blowing down "backs" during the filling shift.

The discharge pressures most widely used are of the order of 6,800 to 7,500 lb./sq. in. although individual examples vary from 5,000 to 9,000 lb./sq. in. One Division is in process of obtaining shear-plates for trials at 4,500 lb./sq. in.

Experience in the Varying Conditions

Airblasting is being carried out in seams varying in thickness from 1 ft. 8 in. to almost 8 ft. It is highly improbable that the seam section will cause any trouble in the thicker seams, but where incidental difficulties arise—such as with bad roof or drilling—their effect is greater in thin seams.

In thin seams difficulty has been encountered in handling the shells and face pipelines; however, the smallest available diameter of shell (2 in.) is adequate, and the length can be much less than is necessary in the thicker seams. There are several successful airblasting installations in seams approximately 2 ft. in thickness.

One drilling problem that may arise is that of the position in the cycle of operations at which drilling is carried out. At many mines it is traditional to drill before cutting, this practice being particularly common in thin seams and not uncommon in thicker ones. Even where gummings are removed

immediately behind the coalcutter, drilling after cutting is often difficult to establish.

When drilling takes place before cutting, displacement of the holes may occur. As the normal clearance provided by the drill is small, such a displacement can cause an obstruction to the insertion of the airbreaker shell. This problem has been overcome to some extent by better noggling of the undercut, and by increasing the diameter of the drill-hole.

Very often displacement in a hole is not significant until a shell is discharged in an adjacent hole. To offset this effect, two or three consecutive shells may be inserted; the first of the series is then discharged, and "leap-frogged" over the others, i.e. the first discharged shell is removed and inserted in the next vacant hole before the second shell is fired.

In early airblasting installations the pipeline along the face consisted of rubber hose, which was coiled on the face or taken out of service by sections as shooting proceeded. This system is still used in some installations but cannot be regarded as completely satisfactory. The hose is vulnerable to abrasion and damage, resulting in high replacement costs and the possibility of accidents through bursting.

Some collieries are now making use of steel face-lines, with "tees" inserted at suitable intervals for attachment of the shooting hose. The necessary flexibility is obtained by the inclusion of short lengths of rubber hose or cupro-nickel. The disadvantage of this type of pipeline is that it must be dismantled and re-assembled each time the face advances, except in a minority of cases, where it is attached to armoured flexible conveyors on prop-free front faces. In the latter case the steel line, being less flexible than the conveyor, should be attached to it loosely to permit snaking.

Quick-release couplings for steel-to-steel and steel-to-hose joints are undergoing trial. These, when proved successful, will add to the advantages of the steel-face-line. Experiments have been made with cupro-nickel face-lines, but on balance they do not appear to be any improvement on steel. There is, however, still room for experiment before the best form of face pipeline can be determined.

No serious difficulty has yet been met due to the gradient of seams worked, the steepest of which is 1 in 2.75. Handling of the shells and face pipelines will clearly become more onerous on very steep gradients, though at no stage need the difficulties become insuperable.

Airblasting has not yet failed in this country by reason of hard coal, dirt bands, or difficulties of this nature, but these conditions must be borne in mind when deciding upon the drilling pattern.

Although the chief application of airblasting in the United Kingdom will probably be on hand-filled faces with machine-cut coal, it is also being used with good effect with those methods of power-loading where systematic braking-down of the coal is necessary, e.g. flight-loading of all kinds, hand-filling on to armoured flight conveyors, and gathering-arm type loaders in room-and-pillar workings. In fact, until the third quarter of 1958, the number of airblasting shots on mechanized faces exceeded that in conventional workings.

A limited amount of airblasting has been successfully carried out in uncut coal, using holes drilled at an angle to the face; coal is burst off the solid after first "breaking in" or shearing by means of a fan-cut. This method of work requires care in choosing and maintaining the drilling pattern, as an overloaded shell will be violently ejected from its drill-hole.

Several collieries have used airblasting in roadhead rippings, with varying success according to the nature of the strata. When airblasting has been established on a coalface, it is a

relatively easy matter to test its efficacy in the rippings. In at least one colliery back rippings are also being blasted by compressed air and in several collieries wastes are being broken down by this means.

Although multi-shot firing as normally understood cannot be achieved with air-blasting, it is possible to discharge a small number of shells in quick succession, provided that each is connected to the compressed air supply through a separate hose and shooting valve.

Incidents Reported During Airblasting

Incidents occurring with airblasting equipment have been mainly of two types :-

- (a) Where the probable cause was the ignition of lubricant applied to the discharge head of the piston-type shells. The type and system of lubrication used was not however in accordance with the manufacturers' original specification and no trouble has been experienced where the appropriate lubricant has been correctly used. Instructions on the best type of lubricant will be issued from time to time by Headquarters.
- (b) Sparking from drill-holes when shear-plate shells were being discharged. Investigations at the Central Engineering Establishment with Armstrong Airbreaker shells have shown that sparking does not occur when non-ferrous or plastic shear-plates are used.

Inspection, Testing and Quality Control

The performance of the equipment has, in general, been good, and little output has been lost through breakdown or failure of the equipment. Early difficulties with hose, shooting valves and hose couplings have been overcome or are being investigated. A revised design of coupling is being considered which is to undergo tests, and investigations are also being carried out on thermal and pressure protection equipment to the compressors. Airblasting compressors are now provided with safety devices, giving a measure of protection.

Testing of sample components has been carried out by C.E.E., but to ensure that the required standard is achieved and maintained a scheme for testing and approval of new components and check testing of existing components is being considered.

Manufacture Service Arrangements and Maintenance

The Armstrong Airbreaker equipment is now completely British made; the compressors, shells, etc., are made by Sheepbridge Engineering Ltd., and other parts by various sub-contractors. Olin Mathieson (the American owning company) have established a factory near London for making a number of ancillary parts, and they propose extending this to provide an overhaul and reconditioning service. This firm have appointed a general manager, a mechanical engineer and field engineers in this country to advise on and to assist with installations of equipment.

The manufacture of Airdox equipment has been established at the Cardox factory at St. Helens for the supply of entirely British-made equipment. The Cardox Company already has field staff throughout the coalfields and these men are able to give advice and assistance on Airdox equipment.

Detailed guidance on the maintenance of airblasting equipment will be included in the Board's Code of Practice for Compressed-Air Blasting Equipment now in course of preparation.

Machinery and Equipment

BRITISH DRILLING MACHINES FOR RUSSIA

Engineers of the U.S.S.R. trade delegation in Great Britain recently witnessed field trials at a Derbyshire quarry of a drilling machine of new design. The first of 15 similar tracked tower drill rigs destined for Russia, it is part of an order already announced worth over £250,000 won by the Holman Group subsidiary, Climax Rock Drill and Engineering Ltd., in conjunction with F. Taylor and Sons (Manchester) Ltd.

In this mobile machine four drifters (Holman medium weight S.L.280 drills mounted on power feed cradles) can be operated simultaneously by two operators without fatigue and over long periods and are capable of drilling a rock face from ground level up to 32 ft. high and with a horizontal span of 24 ft. It was proved at the trials that the rig was stable under drilling conditions even when the platform was in the highest position, the hydraulic booms in the highest position, the drifters spread out to their full width of 24 ft. and the tracks standing on a gradient of 1 in 10.

Four holes can be drilled simultaneously to a depth of 13 ft. and Russian requirements will vary from horizontal holes, slightly dipping holes, to holes angled up to 30 deg. Holman 2½ in. tungsten carbide tipped Holbits will be used and drilling speeds of 16 in. per min. are expected.

In operation, the booms and collapsible tower are hydraulically operated and are remote controlled from panels on the platform above the tower. The tower is mounted on electrically driven tracks which can negotiate rough and uneven ground and a gradient of 1 in 7 was successfully tackled at the recent tests. Crowding rams of 30 in. stroke are provided so that the feed cradle can be pushed up to the rock face and for movement in confined spaces under-

ground the tower can be collapsed to a height of 11 ft. Electric motors of 40 h.p. and 7½ h.p. are provided for track drive and hydraulic pump drive respectively and a compressed air supply of approximately 700 c.f.m. is required.

NEW PORTABLE PROSPECTING KIT

The age of transistorization has reached the geophysical field with Sharpe Instruments' new portable prospecting survey kit. Weighing just 40 lb., the new kit consists of three accurate geophysical instruments for ground survey and determination of ore-bodies. When displayed at the recent Prospectors and Developers Association



Alongside, at right, are shown four Holman drifters in action simultaneously on one of the fifteen tracked tower drill rigs ordered recently for service in Russia. Below, at left, the tower drill is shown in the fully retracted position. The four drifters can be independently and universally moved

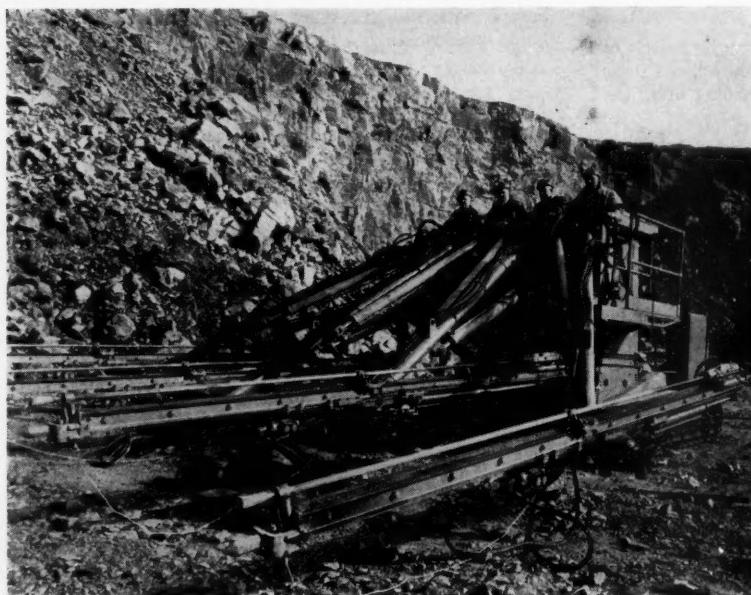
Convention in Canada, the kit created widespread interest through its compactness, portability, and ease of operation. The manufacturers state that complete geophysical gear can now be carried on a prospector's back and operated with the ease of a geiger counter.

First of the three units in the kit is the Sharpe A-3 airborne-ground magnetometer. This magnetometer is rugged, self-leveling and self-orientating, providing a sensitivity of 180 gammas per deg. and a null method accuracy of 50 gammas. Viscous damping enables the operator to make rapid surveys from an aircraft or lurching ground vehicle.

The exceptional portability (3 lb.) means that prospectors may take the instrument into any terrain, making accurate hand-held detail or reconnaissance readings. The operation is so simple that completely untrained personnel can use the instrument. A prospector can now locate an iron deposit from the air and then land and outline it from the ground and accurately determine its magnetic properties.

The second instrument in the portable prospecting survey kit is the Sharpe VP-6 ground voltameter. This critically-accurate instrument is one of the major developments in the spontaneous polarization technique, capable of measuring 5 per cent sulphide mineralization through 50 ft. of bedrock. It is the only self-potential instrument that can be used during both winter and summer. The Sharpe ground voltameter allows two methods of operation, namely fast reconnaissance along a chosen traverse by two operators, or contour determination of a sulphide deposit by one man using a fixed and a moving probe.

The unit is claimed to be remarkably lightweight, with the meter and amplifier tipping the scales at just 6 lb., the probes at only 1½ lb each. A small base, high-porosity transparent pot on each probe greatly improves electrical contact especially on uneven terrain. The battery provides its own anomaly as a local area of relatively negative voltage. Most





Above, the Sharpe Instruments' new portable prospecting survey kit. Below, at left, the component parts of the three instruments comprising the kit

metallic sulphides, graphite, and a few other non-sulphide minerals (if not deeply buried) show this.

Number three of the instruments in the kit is the Sharpe SE-200 electromagnetic survey unit described as a rugged lightweight, versatile EM reconnaissance system for precision surveys, ground reconnaissance and airborne EM follow-up. The entire unit is transistorized to give longer, more trouble-free life under rough handling, plus the portability that is a feature of all three instruments in the kit. The SE-200 allows maximum freedom of movement through any terrain, since there are no wires connecting the transmitter and receiver and the distance between the two is not critical, even for surveys of the highest accuracy. As a matter of fact, precision surveys can be carried out at a separation of 400 ft.

The total weight of the unit (transmitter, receiver, phones, power pack, amplifier) is approximately 20 lb. with one week's supply of batteries. The intermittent pulsed signal produced ensures maximum audibility in any location. Simply described, electromagnetic method is a search for buried wire which is energized by alternating electromagnetic fields from the surface. Nearly all buried metallic sulphides, graphite, and a few other non-metallic sulphide minerals are good conductors. Therefore, they can be energized and produce a secondary electromagnetic field.

A new 34 page catalogue describing their range of mining equipment has been issued by the Consolidated Pneumatic Tool Co. Ltd. This new publication covers all aspects of the equipment which the company produces for mining service, the first twelve pages being given to accounts of the class P range, the class R or rotary range, and to the class T, slow speed horizontal and class FE horizontal balanced opposed ranges. This is followed by thirteen pages of detail regarding the extensive range of rock drilling and roof bolting equipment which the company produces, followed in turn by sections relating to percussive bits and rods, dust collecting equipment, sludge pumps, picks, breakers, and digging tools, rail saws, jacks, rams and hoists and maintenance tools such as impact wrenches, chipping hammers, scalers, nut runners and Lagonda Tube cleaners. All the sections are clearly set out and are clearly illustrated both pictorially and by sectional views and diagrams. The specifications of each class of product are given in concise tabular form.

★

RCA Great Britain Ltd., introduce their electronic metal detector, especially designed for inspecting conveyed materials such as coal, limestone, several types of ore, and timber. By saving high cost machine replacements, and reducing breakdown time, this device very quickly pays for itself. It is extremely sensitive, and will detect the smallest pieces of foreign metal.

The apparatus consists of an inspection aperture, through which the conveyor must pass, and a control unit. When metal enters through the aperture, a signal is generated which may be used to ring an alarm, or actuate any desired control, such as switching off the feeder or spray-marking the metal area. The inspection aperture is available in a number of sizes, in one of two categories. (1) the continuous type through

which the belt is threaded, or (2) the split type which eliminates the need for splicing the conveyor belt.

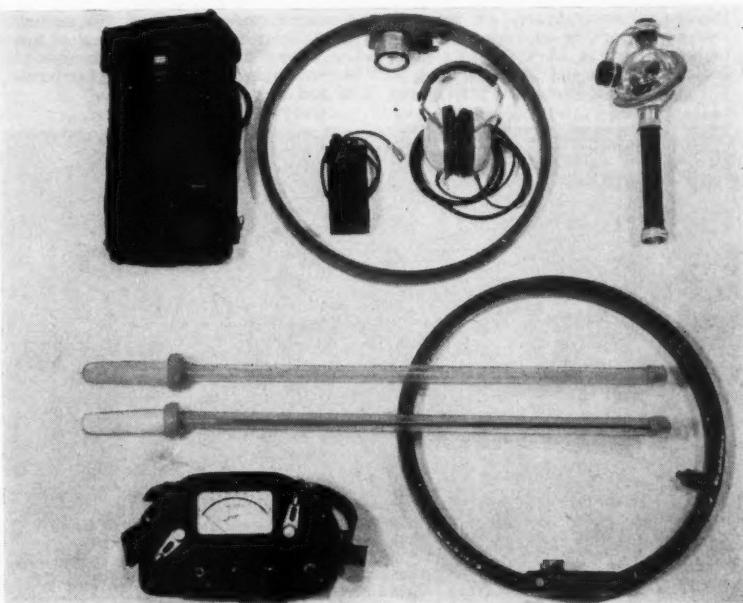
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Springback suction hose, just announced by BTR Industries Ltd., incorporates a new construction designed to obviate damage from accidental crushing. Even after a heavy lorry is driven over it, Springback immediately recovers its shape undamaged. Suitable for either suction or discharge duties, and available in a range of sizes, Springback is designed to meet the roughest operating conditions in any climate.

The secret of the Springback innovation is said to be the use of a strong, flexible rope helix instead of conventional wire spiral reinforcement. The helix is fully embedded in the hose wall giving a smooth, clear bore with a corrugated exterior for increased flexibility and ease of handling. High grade rubber compounds have been incorporated to make the hose almost 100 per cent abrasion proof. Able to withstand high vacuum, the hose will also operate at low pressures on the delivery side of pumps.

★

Class 50000 "Variac" d.c. motor speed controls are announced by Claude Lyons Ltd., as simple, reliable, electric devices that provide adjustable-speed operation of d.c. motors from the standard a.c. mains, so that the convenience of a.c. power supply is combined with the excellent starting characteristics and good regulation of d.c. shunt- or compound-wound motors. The necessary rectifiers, incorporated in the control, are selenium types, and no electronic valves are used in the circuit so that there is no time delay in starting. The controls are made in a wide range of models for motor ratings from 1/15 h.p. to 1½ h.p.



MINING MISCELLANY

Crude zinc output for 1959 of all plants, both Belgian and French of the Société des Mines et Fonderies de la Vieille Montagne, near Liège, totalled the record figure of 176,598 tons, compared with 171,574 tons in 1958. Rolled zinc production was 41,092 tons (41,205); zinc white, 16,947 (18,692); and cadmium 949 (738).

★

Turkey plans to expand the Zonguldak coal works on the Black Sea coast, to bring production from 7,000,000 to 10,000,000 tons annually, in order to meet the extra demand from the iron and steel works to be established at Eregli, which is estimated at 1,800,000 tons annually. Monthly pit-head production at Zonguldak has increased steadily from 363,383 tons in 1950, to 545,847 tons in 1958.

★

Bauxite has become the leading mineral export from the Dominican Republic, production being estimated at 937,000 tons in 1959. The Aluminium Company of America is shipping bauxite from that country.

★

New mining regulations, under which new mining industries would be tax-exempt for a 5-year period, are at present under study by the Mexican Treasury Department. If adopted, the new regulations would also apply to companies which reactivated mines after a 10-year lapse. Spokesmen for the Federation of Mining Associations have said in Mexico City that the regulations would constitute the only possible measure to prevent the Mexican mining industry from collapsing. The proposed regulations would increase the current

Head Wrightson Teesdale Ltd., a subsidiary of Head Wrightson and Co. Ltd., is supplying a large quantity of special duty rolling stock for the Durgapur steelworks in India. Head Wrightson is a member of Iscon, the British consortium building the steelworks, and the wagon contract represents only part of the contribution to this great project made by the company. A total of 120 wagons of many types, all designed and manufactured at Head Wrightson's works at Thornaby-on-Tees, will be used to transport over 4,000,000 tons of raw materials for the blast furnaces per year. Among the special wagons sent to India, are hot metal ladle cars, pig iron carriers, skip cars and those for transporting ore, dust and slag



subsidies paid to small mining companies and would encourage greater investment in the industry.

★

Indonesia is planning to send part of its tin ore to smelters in Penang, Malaya, instead of Texas. However, shipments to Texas are continuing and there is no intention of stopping them in the future. This was disclosed recently by Mr. R. I. Subroto, chief of the general section of the Indonesian State Mines Bureau. He had been asked to comment on a London report that ore from the island of Banka was now going to Penang and that consignments to Texas had ceased. Other sources said Mines Bureau officials had recently surveyed Penang smelting facilities, but no contracts had been signed so far.

★

The Federation of Malaya will be represented by a strong delegation at the U.N. conference on tin in New York this month. The delegation will be headed by Dato Nik Kamil, Malayan Ambassador to the U.S.A.

★

Our correspondent in Australia states that an Australian Government geological report advises of discoveries of copper, zinc and other minerals in the south-west of Niti Levu, Fiji. The report states that further prospecting for base metals, gold, silver and manganese, is warranted.

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A contract has been signed between the New Zealand Government and the Japanese firm of Banno New Zealand Ltd., for the sale of 50,000 tons of coking coal and for the shipment of that quantity of coal to Japan. The price

agreed to is 87s. per ton. The first of a series of shipments was scheduled for early May. Coal produced at the Papa-roa Mine, Westland, would be used for shipment. It is understood that a provision in the agreement of the sale of the coal was that New Zealand would allow Japan to export to the Dominion approved goods to the value of £1 in every £2 involved in the coal deal.

★

Mr. Charles R. Cox, president of Kennecott Copper Corporation, disclosed that Kennecott planned to expand its Chilean production by 100,000 tons a year at the Braden mine. Braden's output is currently running at the rate of 180,000 tons a year. Mr. Cox stated that the expansion would depend upon getting the necessary guarantees from the Chilean Government.

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Preparations are in hand for opening up a new gold mine in the Galas district of Kelantan, Federation of Malaya. The mine will be operated by the Tien Thye Mining Co.

★

A Japanese coalmining company is investigating three promising coalfields in Sarawak, located by the company's fact-finding mission completed in December last. A development survey team has now arrived in the country.

★

Exports of Straits tin, produced in the smelters of Singapore and in the Federation of Malaya, totalled 16,841 tons during the first three months of this year. Of this output, 9,168 tons was shipped to the U.S., 2,380 tons to Japan, and 1,127 tons to the Republic of India.

★

Large reserves of kaolin, estimated provisionally at several million tons, have been found by drilling in the Boralesgamuwa area, south-east of Colombo. Tests have been carried out by the Department of Mineralogy.

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Diamond drilling investigations in the Puttalam area on the west coast of Ceylon have revealed two areas of workable deposits of pure limestone of approximately 10,700,000 tons.

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The occurrence of diamonds has been registered by the Geological Survey of India in the bed of conglomerates near Banganpalle in Andhra Pradesh. Preliminary surveys have disclosed the existence of low quality diamonds. The Government of Andhra has included a comprehensive programme of survey and prospecting of the area in the Third Five-Year Plan.

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Uranium discoveries at Buller Gorge, New Zealand, have given some rich samples, but further exploration is necessary to determine the extent of the occurrences.

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The Polish mining team of Cekop, the Polish foreign trade enterprise for the export of complete industrial plants, is inspecting gold, diamond and oil deposits in Guinea, and negotiations are taking place with the United Arab Republic concerning geodetic surveying in Syria.

The Mining Journal—May 13, 1960

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Metals and Minerals

U.S. Interest in Europe

A further indication of the magnetic attraction which the bright prospects of Europe's expanding markets are exerting on the three major U.S. producers is afforded by the news that Kaiser and Pechiney are to launch a joint project aimed at developing aluminium production. For this purpose a company is to be set up called Cie Internationale pour la Fabrication de L'Aluminium Kaiser-Seichine (CIFAKAS). Its initial capital has been fixed at 8,260,000 new francs made up of 41,300 A and 41,300 B shares of 100 new francs each. Kaiser will be represented through Kaiser Aluminium International Inc. and Pechiney through its investment subsidiary Sechine.

Pending the outcome of negotiations with the governments interested, the country in which the project is to be carried out has not yet been disclosed, but the view has been expressed in quarters described as "usually well informed" that it might well be Spain. The Spanish Government is contemplating an increase in the country's output of aluminium and French and American companies are reported to be prepared to go ahead with plans either to develop existing plants or to build a new one.

According to the company's president, Mr. D. A. Rhoades, Kaiser Aluminium expects sales for 1960 to be "seven to ten per cent higher" than last year's \$435,500,000. Automobile and housing business is picking up and indications point to a prosperous year. Mr. Rhoades stated that there was currently a shortage of aluminium products in Europe.

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The first alumina produced by the Fria international consortium in Guinea left the port of Conakry for Norway early in May. A second ship is currently loading at Conakry with materials destined for the Pechiney-Ugine-Cofimer group. The consortium plans to produce 480,000 tonnes of alumina a year in Guinea. The first shipment totalled 6,000 tonnes.

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The Norwegian/Swiss company Mosjøen Aluminium A/S is to increase annual output capacity at its aluminium smelter in north Norway from 32,000 tonnes to 48,000 tonnes, provided additional electric power can be secured. According to the company's chairman, Mr. A. Monrad-Aas, the Norwegian Hydro Electricity Authority is likely to be able to deliver the power in 1963. Total cost of the expansion has been estimated at Kr. 100,000,000.

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Aluminium Ltd. is proposing to expand its fabricating facilities in Colombia in partnership with Industrias Metalurgicas Unidas SA, a prominent Colombian enterprise, and with other local capital. A new company, Alcan de Colombia SA, is in process of formation and will be owned jointly by Aluminium Ltd. and local capital. Expansion of the existing extrusion plant of Perfiles de Aluminio y Cobre Ltda, in which Aluminium Ltd. already participates, and construction of a new rolling mill are to start immediately.

NORWEGIAN ILMENITE

The Norwegian mining company Titan A/S is to start mining operations in September at the Tellnes ilmenite ore deposits in the Jossingfjord district of West Norway. Production will be around 300,000 tons of ilmenite concentrate annually. Last year, Titan A/S produced 226,000 tons of ilmenite concentrate in the nearby Sandbekk mines.

FINNISH CHROMIUM FIND

Finnish geologists have found what they claim to be the biggest deposit of chromite in Europe. The deposit is situated in the lower part of the Kemi River valley. Recent calculations are reported to have indicated at least 15,000,000 tons of ore and probably considerably more. The quality of the ore

is described as "not the very best, but not so low that it would be uneconomic to mine and enrich it". An important feature of the deposit is its good geographical location. Both railway and river transport are close at hand, there is a port only a few kms. away, and the supply of labour is also good.

VANADIUM IN THE U.S.

Consumption of vanadium in the U.S. was 50 per cent greater in 1959 than in the previous year, reports the Bureau of Mines, U.S. Department of the Interior. Whereas there were no imports of vanadium ore and concentrates in 1958, 10,129 lb. (V_2O_4 content) were reported last year. Imports of other forms of vanadium rose in 1959 to 32,047 lb. (gross weight) from 1,500 lb. in 1958.

U.S. production of vanadium pentoxide increased to approximately 15,900,000 lb. (gross weight) containing 14,000,000 of V_2O_5 in 1959, compared with 10,939,200 lb. (gross weight) containing 9,965,000 lb. of V_2O_5 in 1958.

COPPER • TIN • LEAD • ZINC

It has been an uneventful week on the market with no untoward developments to disturb the overall picture as far as prices generally are concerned. The copper market is best described as hesitant and consequently fresh outside interest has only been on a limited scale which has tended to reduce the volume of trading in the other metals.

COPPER BACKWARDATION NARROW

The Chilean situation continues to overshadow the copper market and the general atmosphere of uncertainty has resulted in consumers being content to await future developments. The undertone of the market, however, remains very steady and this became more pronounced during the week as fuller reports came in of the recent disturbances in the Copperbelt of Northern Rhodesia. Whilst it is impossible, of course, to foresee what will be the eventual outcome of the events which have taken place or, indeed, to make any appreciation of the situation from a distance, the trade as a whole cannot ignore the potential seriousness particularly as far as Europe is concerned of any interruption in supplies from that quarter.

As regards the present state of affairs in Chile, it became known at the beginning of the week that the Copper Confederation had decided in favour of calling out labour at the Chuquimata and El Teniente plants in support of the Potrerillos and El Salvador workers. It was expected that this strike would commence almost immediately, but at the last moment it was postponed when negotiations were resumed between Anaconda and the Confederation. It might also be mentioned in passing that any such sympathetic strike action would be entirely illegal and contrary to the terms of the current contract covering workers at the two plants in question.

A further welcome narrowing in the backwardation in London has followed an increase of 650 tons in U.K. official warehouse stocks last week. Whilst this

may only be a drop in the ocean, it is nevertheless the second consecutive week that a step in the right direction has been taken and the market reacted favourably. In any event the increase and the possibility of further increases has been a contributory factor to the low level of consumer interest. During the week the Belgian price has been reduced from B.fr. 37 per kilo to B.fr. 35.50 per kilo.

In the U.S. the physical copper market has been extremely quiet and brass mills report that the improved demand noted during the latter part of last month has failed to be maintained. Reports indicate that the main producers' order books for May are well filled and present indications point to June shipments being at a satisfactory level. Customs smelters, on the other hand, are not so well placed, as export business which recently has been absorbing a fair quantity of metal which could not find a home in the U.S., is quiet. In February, 1960, mine production of copper in the U.S. rose to 75,300 tons when the last strike-bound mine came back into operation against January's total of 47,900 tons.

TIN PRICES LOWER

Tin prices have sagged after the flurry which took place on the strength of the communiqué following last week's International Tin Council meeting in London. Demand from U.S. quarters leaves a lot to be desired whilst elsewhere it is no better than routine. At a press conference the chairman of the council announced that the U.K. tin stockpile had been entirely liquidated before the end of March this year. U.K. official warehouse stocks last week increased by 90 tons to 7,862 tons. U.S. tin consumption in February decreased 2 per cent, whilst total tin stocks at 37,960 tons were down from 39,635 tons at the beginning of the month.

On Thursday the Eastern price was equivalent to £790 $\frac{1}{4}$ per ton c.i.f. Europe.

LEAD RALLIES—ZINC LITTLE CHANGED

Lead prices in London rallied temporarily on the news that workers at Bunker Hill's Idaho lead and zinc plant had come out on strike but zinc registered little reaction as this development coincided with some influential selling of nearby metal which resulted in a narrowing of the backwardation. The Union of Mine Mill and Smelter Workers decided that the year of unsuccessful negotiations for a new labour contract to replace that which expired end June, 1959, should be terminated and in any case the gap between their demands and the Company's offer appears too wide to bridge in the near future. Unless labour negotiations with other companies in the area show some progress a strong possibility exists that the strike could be extended.

U.S. lead demand last week was satisfactory and zinc producers were able to report some improvement in business in prime western and special high grade. Mine production of lead in the U.S. in February increased but the high level of consumer demand resulted in a decline in producers' stocks to 103,500 tons at the end of the month, which is the lowest figure since January, 1958.

For zinc, April production and shipment figures are as follows compared with the previous month:

	April	March
Production	83,221	86,028
Domestic Shipments	64,251	80,760
Total Shipments	71,926	86,524
Stocks at the End of Month	147,861	136,566

Lead production in O.E.C. countries in March at 63,573 tonnes showed an increase against February's figure of 56,494 tonnes and stocks also showed an increase at 62,282 tonnes compared with 53,402 tonnes. Zinc production was also higher at 80,875 tonnes against 72,712 tonnes but in this case stocks decreased to 45,599 tonnes against 48,037 tonnes at the end of February.

The committee of the London Metal Exchange has decided at a recent meeting that the revised lead and zinc contracts which change the basis of trading in these two metals to warehouse from the present ex-ship basis, will come into force on October 1 next in respect of transactions falling prompt on and after January 2, 1961.

Closing prices are as follows:

	May 5		May 12	
	Buyers	Sellers	Buyers	Sellers
COPPER				
Cash	£2581	£259	£249	£2491
Three months	£2461	£2461	£2431	£244
Settlement		£259		£2491
Week's turnover	10,500 tons		9,425 tons	
LEAD				
Current ½ month	£77½	£77½	£77½	£77½
Three months	£76½	£76½	£76½	£76½
Week's turnover	5,725 tons		10,250 tons	
TIN				
Cash	£791	£791	£786	£787
Three months	£787	£787	£785½	£786
Settlement		£791		£787
Week's turnover	905 tons		580 tons	
ZINC				
Current ½ month	£94	£94½	£91½	£92
Three months	£91½	£92	£91½	£91½
Week's turnover	4,325 tons		7,850 tons	

London Metal and Ore Prices appear on Inside Back Cover.

Mining Finance

In Union Lies Strength

The most outstanding event of the past year for Union Corporation was undoubtedly the flotation of Leslie and Bracken, the two new mines in the Kinross area. The influence of the Kinross project can be felt throughout the Corporation's report and accounts for 1959, extracts from which appear on page 559.

One case in point is the remarkable increase in the market value of investments in the Corporation's consolidated balance sheet. Standing at some £29,500,000 at the beginning of 1959, this figure put on almost 100 per cent during the year to reach almost £58,700,000 at the year-end. Some of this increase is, of course, attributable to the general rise in all stock exchange sections during 1959, but by far the greatest portion is attributable to Leslie and Bracken. These two companies were treated in the 1958 accounts as prospects; that is to say, they were valued merely in terms of the amount of money that had been spent on them. Now that they have come to the market, however, their market value can be taken into account. The importance of this is shown in a note to the accounts which shows that the true year-end value of the parent company's investment in its subsidiary mining companies was £25,564,111, well over three times the value at the beginning of the year.

The Kinross influence is equally apparent in the extremely satisfactory earnings for the year. The attributable consolidated profit rose by almost £1,000,000 to £2,857,000, the improvement deriving almost entirely from a sharp rise in share-dealing profits. This, in turn, almost certainly stems largely from sales of Winkelhaak during the year. This company, it will be remembered, was floated at a time when even today's price levels would have looked high. This resulted in the Corporation having rather more stock on its hands than it would normally wish to, and last year's healthy market provided the means of reducing the holdings to more normal levels.

With these bumper profits added to the strong liquid position already in existence, there will inevitably be investors who will be disappointed in the small increase in the dividend rate — from 3s. 6d. to 3s. 9d. Here again, the main factor in the decision must have been Kinross. It is officially estimated that over the next two-three years, the Corporation is liable to be called on for some £8,800,000 to carry through its investments in Bracken and Leslie. Creditably, the Corporation intends to find this from its own resources, eking out if need be by short-term borrowings. In the long run this is wholly to the good; in the short-term, it obviously means that some dividend restraint is necessary. In any event, however the long-run may turn out to be little more than a sprint, because the nature of the Kinross mines may allow maiden dividends rather earlier than usual after the commencement of production.

HEALTHY TREND IN COPPER QUARTERLIES

An improvement of about £15 per ton in the price received by the R.S.T. group copper producers has enabled them to announce some excellent profit figures for the first quarter of 1960. At Roan, the effect was offset to some extent by a small

cost increase, but Mufulira managed to reduce costs slightly in spite of the higher rate of royalty which was payable. Salient features of the reports are summarised below.

	March '60 Qtr.	Dec. '59 Qtr.
Mufulira		
Sales (£000)	6,776	6,280
Costs (£000)	4,076	4,082
Profit (£000)	2,536	2,008
Roan Antelope		
Sales (£000)	5,797	5,434
Costs (£000)	3,639	3,609
Profit (£000)	1,911	1,564
Chibuluma		
Sales (£000)	1,381	1,357
Costs (£000)	839	790
Profit (£000)	469	493

S.A. COAL STILL LOOKING FOR MARKETS

In his statement to African and European shareholders last year, Mr. T. Coulter, the head of Anglo American's coal organization, disclosed that a mission representing the Southern African coal industry as a whole was to visit South America in 1959. As a possible export market for S.A. coal, the South American continent appeared promising, and the outcome has been eagerly awaited.

Unfortunately it now appears that hopes of building up a substantial export business in that part of the world must be deferred indefinitely. The news that the mission brought back was not encouraging. Although useful contacts were made, various factors, including existing contracts with other exporters and internal mineral policies, made it impossible to make any immediate arrangements.

More encouraging, however, are the prospects for the development of a market in the east. A visit was paid by a similar mission to the Middle East and Pakistan, but this drew a blank, largely because of the ability of Indian producers to supply coal at very low cost. Since then, however, India has placed an embargo on coal exports. This has already resulted in orders from Burma and Ceylon, and there is a good possibility of sales to Pakistan.

The key to the situation, however, rests in the hands of South Africa's potential competitors in this area — China and India — and the industry is therefore treating the present situation as no more than temporary. S.A. coal, in fact, is still looking for markets.

GOOD NEWS FROM WESTERN AREAS

When Western Areas, Johnnies' new gold mine in the south-west Rand, first came to the market last year, it was officially estimated that production would begin some 3½ years after the commencement of shaft-sinking. At last week's annual meeting, however, Mr. D. A. B. Watson had some good news for shareholders. Shaft-sinking progress, he said, had been so good that the time required for the mine to come to production would be "somewhat less" than the original estimate.

LONDON MARKET HIGHLIGHTS

Business in the South African Gold share market dwindled into a trickle of small sales and prices drifted, many of them to their lowest points this year. Mr. Eric Louw's staunch defence of South African apartheid policies hardly helped. Anxious eyes were also turned to Northern Rhodesia whence sudden outbreaks of racial violence were reported.

Free State Geduld and Western Holdings each sagged to 116s. 3d. and in the Far West Rand section West Driefontein weakened to 162s. 6d., Hartebeestfontein (48s. 1d.) and New Pioneer (29s. 4d.) lost further ground and it was not surprising in the general dreary atmosphere that Stilfontein failed to make any response to the encouraging gold values found in the Toni shaft reef intersection.

In Diamonds, De Beers wilted to 133s. 9d., a new low for this year. The general gloom spread into the Finance section where Anglo American steadily eased to 150s. The Union Corporation report was generally considered to be very encouraging, but

with politics overshadowing the whole market the shares slid down to 49s. 6d. Selection Trust, which had previously been firm in anticipation of what is confidently expected to be a good final dividend, fell back 6s. 3d. to 88s. 9d.

The setback in Selection Trust was largely a reflection of the general weakness of the Copper group following the unrest along the Copperbelt. This lowered Chartered to 78s., Nchanga 3s. 1d. to 54s. 4d., and Bancroft 2s. 9d. to 17s. 6d., among several other declines.

"Tanks", which derives the bulk of its revenue from a holding in Union Miniere, the Belgian Congo producer, lost 2s. to 29s.; reports of an exodus of Europeans from the Congo were a major adverse factor here.

A much happier tone was again provided by the Tin group. A steady investment demand, much of it from Singapore, soon absorbed any profit-taking that developed. One of the outstanding movements was the advance of 3s. 6d. to 25s. 6d. in Sungei Besi

that occurred when buyers found stock none too readily obtainable. The latest interim dividend stimulated Pengkalan (9s. 10d.) and Ampat improved to 15s. at one time on the feeling that the final dividend due later this month should be a good one. The Nigerian tin and columbite producer, Bisichi (5s. 9d.) reported a higher final and followed up the news with an annual report telling of a fresh increase in columbite sales which included some of the company's 1962 production.

Lead-zincs were not a great deal changed on balance. Consolidated Zinc, however, after going ex-dividend, improved steadily to 73s. 6d. and North Broken Hill were a firm, if narrow, market at 121s. 3d.

The most spectacular movement of the week was provided by St. John d'el Rey, the Brazilian gold and iron ore property. These shares rocketed from 105s. on Friday night to 132s. 6d. by Wednesday evening. The move was attributed to U.S. buying and there were very few shares to be had — if any — because something like 80 per cent of the equity is held by the chairman and Hanna Mines. Later it was announced that Treasury consent had been obtained for the proposed transfer of control to the U.S.

UNION CORPORATION, LIMITED

(Incorporated in the Union of South Africa)

The following is extracted from the Report of the Directors for 1959

CAPITAL

In accordance with the Resolution passed at the Extraordinary General Meeting of Members of the Corporation held on 26th May, 1959, 700,000 ordinary shares of 2s. 6d. each were issued by the Corporation to a subsidiary in The British South Africa Company Group and, in return, a wholly-owned subsidiary of the Corporation acquired 455,000 ordinary shares of 15s. each in The British South Africa Company.

The issued capital of the Corporation is accordingly now £1,250,000 in 10,000 ordinary shares of 2s. 6d. each.

A further £1,000,000 of 6½% Registered Unsecured Notes 1974/83 were issued (being the balance of the Note Issue referred to in last year's Annual Report).

RESULTS FOR THE YEAR

The Consolidated Profit for the year was £2,856,915 and appropriations have been made from it as indicated below.

1958 £	1959 £
CONSOLIDATED PROFIT FOR THE YEAR attributable to the Corporation (after providing for taxation) .. .	2,856,915
DEDUCT : Expenses of Note and New Share Issues .. .	3,232
Dividends declared .. .	1,148,437
	898,252
	1,151,669
RETAINED BALANCE OF CONSOLIDATED PROFIT FOR THE YEAR .. .	1,705,246
Balance brought forward from 1958 .. .	1,291,593
Less: Attributable to a former Subsidiary Company .. .	145,523
	1,146,070
	1,851,593
DEDUCT : Transfer to Reserves of Union Corporation— Exploration Reserve Account .. .	150,000
General Reserve Account .. .	300,000
Transfers to Reserves of Subsidiary Companies— Exploration Reserve Accounts .. .	1,200,000
General Reserve Accounts .. .	1,650,000
	£1,291,593
Balance carried forward to 1960 .. .	£1,201,316

* Excluding £70,362 Dividends payable within the Group.

The Directors, as on other occasions, have thought it expedient to write down the book cost of certain holdings below both cost and market price to allow for the wasting nature of a substantial part of the portfolio. To this end they have charged the Profit and Loss Account with £150,000 of which £50,000 has been charged in the accounts of a subsidiary company.

In view of the active prospecting being undertaken in a number of fields the Directors have appropriated a further £150,000 to the Exploration Reserve Account in spite of the fact that the large recoupments of exploration expenditure during the year exceeded the cost of exploration by some £163,000.

The major event of the year was the flotation of two further mines in the Kinross area, namely Bracken Mines Limited and Leslie Gold Mines Limited. Members of the Corporation were invited to subscribe at par for shares in these two Companies in the proportion of one share in each company for every ten Union Corporation shares held.

The Corporation itself has a large stake in these Companies, which is mainly held through wholly-owned subsidiaries. In order that Members can more fully appreciate the value of these holdings the Directors have decided upon a new method of presenting the Accounts which now segregate the Corporation's interest in quoted subsidiary mining companies from the Corporation's other interests in the Consolidated Balance Sheet.

The Corporation has commitments to subsidiary mining companies amounting to £8,800,000, which sum it is anticipated will be required over the next two or three years. In the absence of unforeseen circumstances, the Directors are confident that the necessary finance will be available from existing resources, if need be supplemented to some extent by short-term borrowing.

When considering the dividend for the year the Directors had to take these commitments into account. Nevertheless they felt justified in increasing the final dividend to 2s. 9d. making the total dividend for the year 3s. 9d. per share less United Kingdom Income Tax.

THE UNION CORPORATION GROUP OF COMPANIES

During the year Bay Hall Trust Limited, an investment trust incorporated in the United Kingdom, which since its inception has been a subsidiary of the Corporation, reorganised its capital structure. As part of this reorganisation an issue of new shares was made for cash at par. Whilst the Corporation has retained its investment in the Company, it did not itself participate in this issue, but Members of the Corporation were offered shares in the proportion of one new Bay Hall share for every five Union Corporation shares held. As a consequence Bay Hall Trust ceased to be a subsidiary of the Corporation which, however, continues to act as Managers.

Attention has already been drawn to the flotation of two new mines (Bracken Mines, Limited and Leslie Gold Mines, Limited) in the Kinross area under the Corporation's auspices. Work has begun on the sinking of shafts on both mines. Winkelhaak Mines, Limited, the first, and hitherto only, mine in the Kinross area has now been declaring monthly profits for more than a year, during which time the grade and profits have steadily improved. In the Orange Free State, St. Helena Gold Mines, Limited further increased the tonnage milled, grade, reserves, profits and dividends, whilst continuing to carry on a substantial capital expenditure programme designed to open up more of its lease area and further expand operations. The older mines of the Eastern Rand are still earning handsome profits which have been well maintained during the year even though in some cases mining operations are becoming more difficult and ore reserves are declining.

On the base metal side, San Francisco Mines of Mexico, Limited has been forced to pass its dividend for the second year in succession as a result of the poor market for its products and the low metal prices ruling, coupled with the continuing very heavy burden of Mexican taxation.

Both the production and the profits of South African Pulp and Paper Industries Limited have been at a record level. Work is continuing on the construction of a newsprint plant at the company's Enstra mill.

EXPLORATION

Further exploratory drilling was carried out in the Kinross field outside the three lease areas and the Corporation continued to be active in other parts of Southern Africa and elsewhere.

BOARD OF DIRECTORS

During the year Colonel The Lord Rohins, K.B.E., D.S.O., President of The British South Africa Company, was appointed a Director of the Corporation.

The full Report and Accounts (copies of which can be obtained on application at the London office, 95 Gresham Street, London, E.C.2) include further details of the progress of the companies under the administration of the Corporation, brief particulars of the progress of other companies in which the Corporation is interested, sections dealing with the South African Gold Mining Industry and statistics of World Gold Production, Consumption, Distribution and Reserves and the Corporation's Trade Cycles Chart, revised to date.

Book Reviews

Records of the Geological Survey of Tanganyika. (*Annual Report, Part II.*) Vol. VII, 1957. Published by the Government Printer, Dar es Salaam, 1959, Price 17.50 Shs. pp. 106.

This number contains articles on progress reports and notes on studies being currently made by the regional geology department, economic geology, engineering geology and reports of special investigations which have been undertaken on helium-bearing gases and the Hot Springs. The Appendices include limestone analyses, complete analyses of rocks, carried out in 1957, and analyses of natural gases and accompanying spring waters. A quarter degree sheet 70 SW of Mbeya is included.

Statistical Register of Western Australia for 1956-57. Published by the Commonwealth Bureau of Census and Statistics, 1959. Perth.

This publication is divided into eleven parts, giving complete statistics including those on the following subjects: Population, Public and Private Finance; Trade, Transport and Communication; Mineral and Water Conservation; and Total Production. The section on mineral statistics includes those on mine and quarry production, gold production from 1886 to 1957, and dividends paid by mining companies, details on gold mining leases, employment in mining and quarrying and information on leases, areas, claims and rights.

Yearbook of International Trade Statistics, 1958, Volumes I and II. Published by the United Nations. New York, price £2. 2s. 6d. for Vol I, and 14s. for Vol II.

The ninth issue of the United Nations Yearbook of International Trade Statistics, prepared by the Statistical Office of the U.N. Department of Economic and Social Affairs is, for the convenience of users, divided into two volumes. The first volume contains detailed data for 122 individual countries and basic summary tables showing, *inter alia* the contribution of the trade of each country to the trade of its region and of the world, analysing the flow of trade between countries and describing the fluctuations of the prices at which the goods moved internationally. The second volume, designed primarily for users interested in the broader economic aspects of external trade, presents summaries which, for about 90 per cent of this trade, permit analysis simultaneously by countries of provenance, by countries of destination and by seven large commodity classes.

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The Allen West Story, published by Allen West & Co., Ltd. This presentation edition published on the occasion of the firm's golden jubilee, gives the story of fifty years of electric control gear development, and gives an interesting account of activities which included the opening last year of new laboratories for research work, and the establishment of an apprentices' training school which is considered one of the best equipped in south England.

LONDON AND RHODESIAN MINING AND LAND COMPANY

CHAIRMAN'S REVIEW OF OPERATIONS

The 51st Annual General Meeting of the Company was held on May 4 in London. In the absence of the chairman, Brigadier S. K. Thorburn, due to indisposition, Mr. A. H. Ball, the Managing Director, read the Chairman's statement, from which the following are extracts:

The accounts cover a fifteen-month period following upon our decision to change the Company's financial year-end from June 30 to September 30.

Total net revenues at £181,536 compare very favourably with the total for the twelve months ended June 30, 1958, of £128,000. The improvement arose mainly from the investment operations of our subsidiary The African Investment Trust, Ltd., which produced a profit on realization of investments of £19,032 as against a comparable profit of only £1,996 in the previous year. Mining Revenues at £61,638 show more than a proportionate improvement over the £42,654 in the earlier period and the increased profit is attributable to the operations of our subsidiary company, Mazoe Consolidated Mines Ltd.

The profit before taxation at £124,973 was over 50 per cent. higher than in the previous twelve months and of this amount taxation absorbed £40,855. The net profit amounted to £82,372 (as compared with £43,397).

In view of the necessity to maintain the group's liquid resources the Board has been conservative in providing for a total dividend of 7½% less tax, absorbing £45,938 (as against 5% absorbing £28,750 in the previous year).

The Consolidated Balance Sheet discloses what I regard as a strong position. With regard to investments, despite the

recent sharp recession in Stock Exchange prices, an up-to-date valuation has shown that the market value of the group's quoted securities is still approximately £250,000 in excess of the figure at which those investments stand in the Company's books.

Ranching

The cattle year has been a very difficult one. The mistakes of the past came back on us pretty badly at Wiltshire and we lost a greater number of cattle than I think we should have done had Wiltshire been in the same state of development as Lochard. However, our organization is now working well. The new breeding policy which we established is beginning to bear fruit and the calves which we are now obtaining are very much better than they have been in the past.

The Lochard ranch is doing excellently and the Lancashire ranch is developing extremely well.

Looking towards the future of your Company, I think that in spite of the fact that we shall not have a good cattle year this year, the figures that I hope to tell you in a year's time should be satisfactory and the profits at least as good as for 1959.

At the present market price of your Company's shares the whole of your interests in Southern Rhodesia stand in at an absurdly low figure and, provided one has the courage to face the political risk, I still believe that they are an extremely sound investment.

The report and accounts were adopted.

WESTERN AREAS GOLD MINING COMPANY LIMITED

(Incorporated in the Union of South Africa)

EXTRACT FROM CHAIRMAN'S SPEECH

The First Annual General Meeting of Members was held at Johannesburg on May 6, 1960. Mr. D. A. B. Watson (Chairman) presided and, in the course of his speech, said:—

The company was incorporated on September 8, 1959, and the Directors' Report and Statement of Accounts for the period ended December 31, 1959, which have now been in the hands of members for some time, set out fully the details of the capital funds raised by the company, the preliminary expenditure incurred and the financial position at the year-end.

Good progress has been made with the erection and equipment of surface installations on the property, and in shaft sinking. Sinking commenced at the ventilation shaft on January 20, 1960, and at the main shaft on March 13, 1960. As recorded in the company's report for the quarter ended March 31, 1960, the depths below collar, reached at that date were 356 feet and 1,597 feet for the main and ventilation shafts respectively. Yesterday morning, May 5, 1960, the

main shaft had reached a depth of 974 feet and the ventilation shaft a depth of 2,178 feet, being an advance in the five weeks since April 1 of 618 feet and 581 feet respectively.

The geological sequence through which both shafts are expected to pass is as follows:—

Firstly, 1,000 feet of shale and quartzites of the Pretoria series, followed by 1,700 feet of dolomite and 600 feet of lava before the Ventersdorp Contact Reef, the uppermost of the economic reefs, is encountered at an estimated depth of about 3,300 feet. The various horizons of the Elysburg Reefs will, it is expected, be encountered between the depths of 3,320 feet and 3,375 feet below surface.

As is well known, the dolomites in this area frequently contain considerable quantities of water which, if encountered, might well impede shaft sinking. The main shaft is still in the Pretoria series and has not yet entered the dolomites, but the ventilation shaft has already been sunk through 1,178 feet of dolomite,

leaving about 522 feet still to be traversed. I am pleased to report that the sinking of this shaft has not as yet been unduly retarded by the presence of water in these measures.

The location of the two shafts, which are within 225 feet of each other, was chosen for technical reasons and without reference to the probable value of the reefs in the immediate vicinity of the shafts. In the light of evidence obtained in the original prospecting boreholes it is considered that the values disclosed in this vicinity may well be lower than the average values which are expected throughout the whole claim area. The value of the reefs to be exploited can naturally only be determined after the completion of a reasonable amount of development and in this regard, I would

like at this stage to mention that development which may begin towards the end of this year will in the initial stages be confined principally to haulages and tunnels driven off reef. Reef development and the resultant information regarding the value of the ore in the mine will follow at a later stage.

The progress in shaft sinking which has been achieved to date gives hope that, provided no unexpected adverse conditions are encountered, the time required to bring the mine into initial production will be somewhat less than that envisaged in the Consulting Engineers' report contained in the Company's Prospectus, in which it was estimated that the mine might go into production some 3½ years after the commencement of shaft sinking.

THE VEREENIGING ESTATES LIMITED

(Incorporated in the Union of South Africa)

IMPROVED PROSPECTS IN COAL EXPORT MARKETS

The following are extracts from the review by the chairman, Mr. T. Coulter, which has been circulated with the annual report and accounts:—

Accounts:

Comparable figures for the previous financial year are given in parentheses.

Gross revenue for the year amounted to £1,450,688 (£1,282,143). After deducting expenses, including provision for taxation, the net profit amounted to £1,387,689 (£1,182,723).

Adding the balance of unappropriated profit amounting to £266,194 (£253,197) brought forward, the total to be dealt with was £1,653,883 (£1,466,194). Appropriations comprised £100,000 (£100,000) to general reserve, while dividends for 1959 at 8s. 6d. per stock unit absorbed £1,168,750 (8s.—£1,100,000) leaving an unappropriated balance of £385,133 (£266,194) to be carried forward.

Share investments in subsidiary companies have increased by £457,512 to £7,470,112 whilst the total investments in fixed assets amounting to £9,700,323 is approximately £400,000 higher than a year ago. Current assets exceed current liabilities by £792,813.

Coal Industry

The total output of coal in the Union for 1959 was 39,193,271 sales tons, a drop of 747,005 tons on the previous year. Colliery companies subsidiary to and associated with The Vereeniging Estates, Limited, contributed 13,699,284 tons, equal to 35.0 per cent., a decrease of 139,487 tons compared with 1958.

Contrary to expectations, the demand for coal in the inland market fell away appreciably during 1959, even allowing for heavy stocks brought forward from 1958.

The general recession in business which made itself felt early in the year under review coincided in a large measure with the completion of certain long-term projects on the South African Railways to improve and expand transport facilities, particularly from the Witbank and Orange Free State coalfields.

As a result, supplies of trucks to the collieries during 1959 were maintained

at a level somewhat higher than the available trade.

Improved railway facilities enabled the industry to entertain once again the prospect of entering the export business. This proved no easy task. South Africa now re-enters the field when there is a great deal of surplus output capacity and heavy stocks in most coal-producing countries, and in competition with countries which have been able to maintain external trade connections throughout the years when the Union was debarred through lack of adequate railway transport from maintaining contact with some of its old-established overseas markets.

A joint mission representing Transvaal, Natal and Rhodesian coal interests, made an exploratory visit to South America but found little prospect of doing business. A similar mission to West Pakistan met with no immediate success, but the prospects of eventually doing limited business in that country are somewhat brighter. However, since the beginning of 1960 prospects in the export market have suddenly changed for the better. Restrictions recently applied by the Government of India on the export of Indian coal have opened up new avenues of trade in the Bay of Bengal and important consumers in Ceylon and Burma have already placed substantial orders with Transvaal and Natal producers.

Although 1960 opened quietly for the coal trade in the inland market, all the indications point to a steady improvement in the demand from consumers.

Coke and Coking Coal Trade

The company's interest in the coke trade is centred in the sub-subsidiary, Vryheid Coronation Limited.

Sales of coke for 1959 fell below anticipations mainly as a result of unexpected delays in bringing a new blast furnace into commission at the Newcastle Works of African Metals Corporation Limited (Amcor).

Coke production was continued at a fairly high level of output in expectation of increased demands by Amcor and also in anticipation of some export business being obtained. Unfortunately these hopes were not realized with the

result that stocks of coke had risen to a somewhat high level at the end of 1959.

Efforts to secure export business in 1959 proved quite unsuccessful, but early in 1960 coke producers secured an order of some 15,000 tons for delivery to Burma during the current year. This is the first bulk order obtained in the coke export market for many years past.

Sales of blend coking coal from the three Transvaal collieries specializing in this particular business under long-term cost-plus-profit contracts, totalled 1,621,092 tons in 1959, an increase of 191,944 tons compared with 1958.

Refractories

Affected by the general recession in business activity throughout the Union, Vereeniging Brick and Tile Company Limited had a slightly smaller turnover during 1959 and did not quite match the record profit earned in 1958.

The dividend on its ordinary share capital was however maintained at 1s. 4½d. per 5s. share.

The current year has started on a reasonably confident note with a satisfactory volume of orders on hand. In regard to the future outlook, the demand for certain lines of refractories is continually rising and it has become necessary to plan for further increases in the output capacity of the refractories division.

The capital expenditure involved in this expansion programme will in all probability exceed the immediate cash resources of the company, and it is therefore proposed to arrange for temporary loan facilities until the programme has been completed, when the question of liquidating the loan indebtedness by raising further capital will be considered.

Investment Portfolio

Investments in subsidiary companies have been increased through subscription to and underwriting the new issue of one for one at par made by Springbok Colliery Limited. Another smaller addition was the purchase of 10,000 preference shares in Vereeniging Brick and Tile Co. Ltd.

The market value of investments in subsidiary companies at the end of the year was £19,093,769 as compared with a book cost of £7,470,112.

Investments in other companies having stock exchange listings increased from £1,186,701 to £1,391,292 when the company acquired additional holdings of equities in African Metals Corporation Limited, Natal Coal Exploration Company Limited and The Union Steel Corporation (of South Africa) Limited. Market value of these investments exceeded book cost by £344,339.

BOARD CHANGES

Major-General W. W. Richards has resigned as chairman of Gold and Base Metal Mines of Nigeria. Mr. C. J. Burns has been appointed a director and appointed chairman.

Mr. F. A. Rogers has retired as a director of the Consolidated Mines Selection Company. He had been associated with the company since its inception in 1897. Mr. P. J. Oppenheimer has been appointed a director in his place with effect from May 11.

THE BURMAH OIL COMPANY, LIMITED

The Annual General Meeting of the Company will be held in Glasgow on June 2, 1960.

The following is summarized from the Statement by the Chairman, Mr. W. E. Eddie, which has been sent to stockholders.

Accounts

In 1959 we obtained a satisfactory share of the expansion in petroleum product trade in the countries where we operate, but with smaller profit margins available the Group Profit on Trading was only slightly higher at £6,880,434 compared with £6,778,505 in 1958.

Dividends from Trade Investments and Other Dividends and Interest were substantially greater than in 1958 and after charging taxation and the cost of increasing the capital the net profit for the year is £8,899,947 compared with £7,506,141 in 1958, an increase of £1,393,806.

The Board has appropriated £1,537,980 to General Reserve and recommends a final dividend for 1959 of 1/3d. tax free, payable on June 10.

Oil India Private Limited

Agreement was reached with the Government of India during the year under which The Burmah Oil Company (Pipe Lines) Limited, a wholly-owned subsidiary of your Company, was commissioned to design and superintend the construction of the pipeline from the oil-fields to the Government refineries. Pipe for the first stage of the line, to Gauhati, was ordered in the United Kingdom during the year and is in the course of delivery to the site.

Under the Agreement concluded with the Government of India regarding the formation of Oil India, your Company undertook to arrange to provide a loan of £10,000,000 against the foreign exchange requirements for the construction of the pipeline. During the year Her Majesty's Government agreed to lend £3,000,000 to the Government of India also for this purpose provided this sum was spent in the United Kingdom. When this offer was accepted your Company agreed to furnish a further loan of up to £10,000,000 against foreign exchange requirements. These requirements are now likely to be substantially less than originally expected as in the meantime the Government of India has arranged to erect a tube mill which is expected to fabricate a large part of the pipe required for the second stage of the line from Gauhati to Barauni. The total cost of the line is estimated at £3,500,000.

Trading

In Burma with the improvement in security conditions there has been an increase in the demand for petroleum products and our share of the trade rose by 11 per cent over 1958.

Sales in Pakistan were 9 per cent higher than in 1958. Toward the end of 1959 a new price formula was agreed with the Government but selling prices have not been reduced since Government has announced its intention of levying additional duties to absorb any price reductions which would otherwise result.

Gas Sales from Sui increased by 20 per cent over 1958. Sales through the Sui-Multan Line did not reach the expected level because of delayed completion of the Multan power station but a substantial increase in the offtake of this line is expected in 1960. Proposals for additional utilization of gas are under

examination in conjunction with the Government of Pakistan.

In India the overall development of the country's economy brings with it an ever increasing requirement for energy. Sales through our Subsidiary and Associated Companies were 8 per cent higher than in 1958. A new price formula, under which reduced margins are being allowed to the Oil Companies, was negotiated with the Government of India at the end of October, 1959, effective to March 31, 1961. Prices to the public have not been reduced; the reduction in margins is being absorbed by the Government in the form of additional duties.

Oilfield Operations

Burma: Stockholders may remember that in 1949, as the result of disturbed conditions then prevailing, the personnel establishment working in the Yenangyaung field was reduced to a caretaker basis. Conditions there have been steadily improving over recent years and arrangements are now being made to undertake limited development operations and to drill a deep test in 1960.

Pakistan: In preparation for further anticipated increases in gas offtake some additional drilling in the Sui Gas Field will be required and additional purification units are being erected for Sui Gas Transmission Company which operates the Sui-Karachi gas pipeline.

Agreement between the Sui Gas Transmission Company and the U.S. Development Loan Fund Authorities for a \$2,000,000 loan for this extension to the purification plant has now been signed. When the work has been completed the capacity of the plant will be increased from the present 52,000,000 cu. ft. per day to about 120,000,000 cu. ft. per day.

In East Pakistan preparations were made during the year for the start of production at Sylhet to provide the gas requirements of a fertilizer factory being erected by the Pakistan Industrial Development Corporation at Fenchuganj; this plant is expected to become fully operational in mid-1961.

Following the discovery of gas pools in the first well drilled at Chhatak, arrangements were put in train to pipe gas a distance of 12 miles to a cement works operating in this area. Production from the well should be started in mid-1960.

India: Further drilling during the year failed to prove any additional oil pools in the Assam Oil Company Limited's Digboi field and development drilling has now been completed.

In Oil India Private Limited's Naharkatiya, Hugrijan and Moran areas extension and development drilling has continued successfully. Fifteen wells were completed during the year, twelve of them as oil wells, one as a gas well and two dry holes. These results have added to the proved reserves and it is considered that the potential of the field is now about 2,750,000 tons of crude oil per year.

Prospecting

Burma: In Burma the extensive prospecting programme of The Burma Oil Company (1954) Limited was continued.

Pakistan: A sizeable gas field was proved at Kandhot in West Pakistan and will provide a useful addition to the Sui reserves. The Chhatak well in East Pakistan was successfully completed as a discovery well of a new gas field.

India: Towards the end of 1959 the Government of India invited foreign oil

companies to join in the quest for oil in India subject to mutually acceptable terms to be agreed by Government with each individual company and in accordance with the Petroleum and Natural Gas Rules, 1959. Assam Oil Company has informed Government of interest in this quest. This change of Government policy (since early 1956 no new concessions for oil exploration have been granted to private enterprise) would seem to be dictated by the urgent need for large-scale oil exploration programmes, involving large amounts of foreign exchange, if Government's production target of 14,000,000 tons of crude oil annually by 1966 is to be realized.

U.S.A.: An agreement was reached last August with Murphy Corporation of El Dorado, Arkansas, for joint exploration and oil development operations in Louisiana and Texas offshore areas. At the end of the year drilling had commenced at the first well under this new venture and plans were also being made to acquire interests in oil concessions and for the drilling of a number of wells.

Canada: Agreement was also reached with Murphy Corporation for joint operations in certain concessions in north-western areas held by Murphy-Canada Oil Company. In December following the winter freeze-up seismic work has been undertaken in one area, and core drilling in another.

These ventures in the Western Hemisphere mark a significant milestone in the history of the Group and we are hopeful that they will in time make a contribution to the fortunes of your Company.

This is the second occasion on which the Group's activities have spread beyond the boundaries of its traditional areas of operation — Burma, India and Pakistan. The first occasion was over half a century ago, when your Company acquired an interest in the concessions in Persia then held by Mr. W. K. D'Arcy, the first step towards the birth of The British Petroleum Company Limited.

Refineries

Negotiations were carried on during the year with the Government of Pakistan for the setting up of a refinery at Karachi to be owned jointly by your Company, Shell, Standard-Vacuum, Caltex and the public of Pakistan. An agreement was signed at the end of November, 1959, under which 60 per cent of the equity share capital of the refining company will be subscribed by the Oil Companies and 40 per cent will be offered to the public. This refinery, which will have a processing capacity initially of 1,500,000 tons of crude oil per year, is designed to meet the requirements of West Pakistan and should be in operation at the end of 1962.

At Bombay, the Burmah-Shell refinery processed 2,300,000 tons, an increase of 10 per cent on 1958.

Public Sector Developments

Through its Oil and Natural Gas Commission the Government of India continues prospecting in various areas.

The Government-owned refinery company has arranged to acquire the plant for the refinery at Gauhati from Rumania, and that for the Barauni refinery from Russia. It is understood that the former will be completed by December, 1961, and the latter in 1963.

A company wholly-owned by Government has been incorporated to distribute and market products from the Government-owned refineries. It has also been announced recently that this company may import Russian oil for sale in India.

INSTITUTION OF MINING AND METALLURGY

ANNUAL DINNER

The annual dinner of the Institution of Mining and Metallurgy was held at the Goldsmith's Hall, London, on Thursday, May 5. Dr. J. H. Watson, C.B.E., M.C., president of the Institution, was in the chair.

The Rt. Hon. the Earl of Perth, Minister of State for Colonial Affairs, in proposing the toast of the Institution said that the present atomic age would not have been possible without the research work which had been done on metals and metallurgy. He emphasized that metals were of increasing importance to colonial territories, especially if they reached independence—citing the example of Sierra Leone which will attain independence next year—with its diamonds and iron ore in large quantities. This independence was not possible without the basis of a metal industry. Normally their economies were based only on agriculture and they had to develop a basic industry to become self supporting. It was therefore the duty of the mining industry to explore this and help them to achieve economic independence as well as political. In these territories the two important slogans were, firstly, "one man, one vote, irrespective of colour", and

secondly, "the need for foreign capital".

These demands must be satisfied in the interest of advancing these territories within the western framework. The mining companies must provide training for the indigenous population so that they could in due course learn to run their own industries.

The President, replying, said that under the exchange of students scheme a good many students from abroad came here and others went from here to gain experience in the mines and metallurgical works in this and other countries. The Gold Medal of the Institution this year had been awarded to Mr. Julius Kruttschnitt, of Australia, and to Mr. E. D. McDermott, past president of the Institution. Honorary membership was being conferred on Lord Robins for his services to the mineral industry in South Africa, on Sir Reginald Patrick Linstead, the rector of the Imperial College of Science and Technology, and on Colonel G. A. Whitworth, until recently principal of the Camborne School of Metalliferous Mining.

There was an increasing readiness of producers of base metal to adjust their output to the needs of the market, to the

great increase in speed in shaft sinking, and to the outstanding advance in the blast furnace production of zinc. There was an incessant demand from the aircraft industry for metals and alloys of high standing and higher temperatures which was being met, as well as the other increasing requirements of metals of the highest purity in other realms of industry.

Dr. Watson also referred to the increasing membership of the Institution which was now about 3,000.

Professor David Williams, president-elect of the Institution proposed the toast of the guests, which included men distinguished in public life, members of kindred societies and institutions and eminent people from the mining, metallurgical and geological industries.

Mons. Andrew J. Clasen, Ambassador for Luxembourg, responding for the guests, said that Luxembourg though small was to a high degree industrial, its principal industry being concerned with mining and metallurgy. The iron and steel industry indeed was the lifeblood of their economy and the source of their prosperity. 7 million tons of ore, producing 3½ million tons of steel, were mined every year. This was 10 tons of steel per head of the population. The industry flourished because of the development of the Bessemer process.

Mons. Clasen, before joining the diplomatic service, was a student at the Royal School of Mines, graduating in metallurgy.

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Company News

The Cementation Co. (Canada) have been called in to deal with difficulties being encountered in the freezing process for shaft-sinking adopted by The Potash Company of America at Patience Lake, 15 miles east of Saskatoon, Canada.

Two British companies have appointed the American subsidiary of Megator Pumps and Compressors as their sole agents in the U.S.A. The companies are Greengate and Irwell Rubber Co., and Conflow Ltd. The Megator U.S. subsidiary, which has its headquarters at Pittsburgh, Penn., has just been renamed Megator Corporation.

James Bowen and Son of Edinburgh have been appointed sole agents for the sale and service of Matbro Fork Lift Trucks in Scotland, the appointment to take effect immediately.

The Siemens Organization is again exhibiting electrical appliances including the rotor of a top-gas turbine for 5.6 MW. at the 1960 German Industries Fair in Hanover.

Products of the Cape Asbestos Co. have been on exhibition at the Fuel Efficiency and Power for Industry Exhibition at Olympia, London.

The Morgan Crucible Co. will be exhibiting the Engineering Centre's group stand at the British Exhibition to be held in New York from June 10-20 this year. Among their exhibits will be a working muffle type electric furnace, fitted with Morgan "Crusilite" silicon-carbide electric furnace elements.

Ford Motor Co. are to build a new 1,000,000 sq. ft. factory, at an estimated cost of £10,000,000 for production of their Fordson tractors on a 100-acre site on the northern fringe of Basildon in Essex. Staffing of the new factory will be met by those at present employed on tractor production at Dagenham. This is part of their £70,000,000 expansion plan announced last February. The company already have a general engineering factory employing 1,100 on a 17-acre site in Basildon.

Press and Public Relations Ltd. have announced that as from May 9, 1960, their new address will be: Ferguson House, 15-17 Marylebone Road, N.W.1. Tel.: WELbeck 7431.

Brookhirst Igranic, a company in the Metal Industries Group, is to supply crane controls valued at £120,000 to the new Spencer works of Richard Thomas and Baldwins at Llanwern, near Newport, Monmouthshire.

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This feature appears every fourth week

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Obtainable in London from
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LONDON METAL AND ORE PRICES. MAY 12, 1960

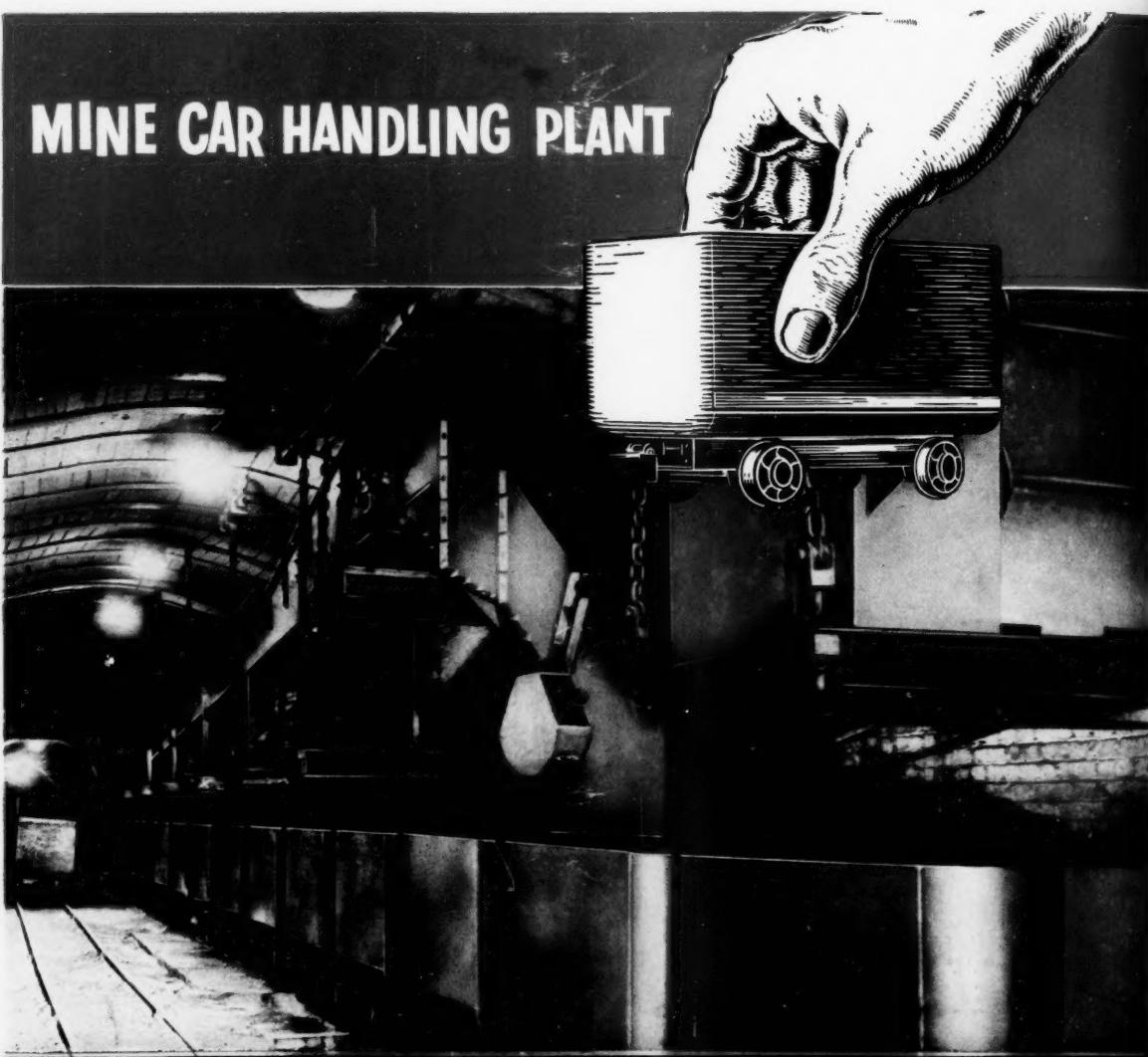
METAL PRICES

Aluminium, 99.5%, £186 per ton	Manganese Metal (96%/98%) £275/£285
Antimony—	Magnesium, 2s. 2d./2s. 3d. lb.
English (99%) delivered, 10 cwt. and over £190	Nickel, 99.5% (home trade) £600 per ton
per ton	Osmium, £22/£22 oz. nom.
Arsenic, £400 per ton	Osmiridium, none.
Bismuth (min. 1 ton lots) 16s. lb. nom.	Palladium Imported, £8 12s. 6d.
Cadmium, 10s. 6d. lb.	Platinum U.K. and Empire Refined £35 5s.
Chromium, Cr, 99% £16 0s. lb. delivered U.K.	Imported £28/£28 6d.
Chromite, Cr, 99% £6 11d./7s. 4d. lb.	Quicksilver, £70/£71 ex-warehouse
Cobalt, 12s. 6d. lb.	Rhodium, £45/£48 oz.
Germanium, 99.99%, Ge, kilo lots 2s. 5d. per gram	Ruthenium, £16/£18 oz. nom.
Gold, 25os. 0d.	Selenium, 50s. 0d. per lb.
Iridium, £23/£25 oz. nom.	Silver, 79 <i>½</i> d. f. oz. spot and 79 <i>½</i> d. f'd
Lanthanum, 98%/99% 15s. per gram.	Tellurium, 21s. 6d. lb.

ORES AND OXIDES

Antimony Ore (60%) basis	..	..	..	..	..	19s. 6d./21s. 6d. per unit, c.i.f.
Beryl (min. 10 per cent BeO)	..	..	..	..	..	230s./235s. per l. ton unit BeO
Bismuth	..	..	..	..	..	65% 8s. 6d. l.b. c.i.f.
					18/20%	1s. 3d. lb. c.i.f.
Chrome Ore—						
Rhodesian Metallurgical (semifriable 48%)	(Ratio 3 : 1)	..	..	..	..	£15 5s. 0d. per ton c.i.f.
Hard Lumpy 45%	(Ratio 3 : 1)	..	..	..	..	£15 10s. 0d. per ton c.i.f.
" Refractory 40%	(Ratio 3 : 1)	..	..	..	..	£11 0s. 0d. per ton c.i.f.
" Smalls 44%	(Ratio 3 : 1)	..	..	..	..	£13 5s. 0d. per ton c.i.f.
Baluchistan 48%	(Ratio 3 : 1)	..	..	..	..	£11 15s. 0d. per ton f.o.b.
Columbite, Nigerian quality, basis 70% combined pentoxides (Ratio 10 : 1)	Nb ₂ O ₅ : Ta ₂ O ₅	..	..	..	175s./180s. per l. ton unit c.i.f.	
Fluorspar—						
Acid Grade, Flotated Material	..	..	..	..	..	£22 13s. 3d. per ton ex. works
Metallurgical (75/80% CaF ₂)	..	..	..	..	..	156s. 0d. ex. works
Lithium Ore—						
Petalite min. 34% Li ₂ O	..	..	..	..	..	47s. 6d./52s. 6d. per unit f.o.b. Beira
Lepidolite min. 34% Li ₂ O	..	..	..	..	..	47s. 6d./52s. 6d. per unit f.o.b. Beira
Amblygonite basic 7% Li ₂ O	..	..	..	..	..	75s/85s. per ton f.o.b. Beira
Magnesite, ground calcined	..	..	..	..	..	£28 0s./£30 0s. d/d
Magnesite Raw (ground)	..	..	..	..	..	£21 0s./£23 0s. d/d
Manganese Ore Indian—						
Europe (46%-48%) basis 67s. 6d. freight	..	..	..	..	..	73d./75d. c.i.f. nom.
Manganese Ore (43% - 45%)	..	..	..	..	..	69d./71d. c.i.f. nom.
Manganese Ore (38% - 40%)	..	..	..	..	..	nom.
Molybdenite (85%) basis	..	..	..	..	..	8s. 11d. per lb. (f.o.b.)
Titanium Ore—						
Rutile 95/97% TiO ₂ (prompt delivery)	..	..	..	..	..	£28 0s. 0d. per ton c.i.f. Aust'n.
Ilmenite 50/52% TiO ₂	..	..	..	..	..	£11 10s. per ton c.i.f. Malayan
Wolfram and Scheelite (65%)	..	..	..	..	..	146s. 0d./151s. per unit c.i.f.
Vanadium—						
Fused oxide 95% V ₂ O ₅	8s. 8s. 11d. per lb. V ₂ O ₅ c.i.f.
Zircon Sand (Australian) 65-66% ZrO ₂	£16/£16 10s. ton c.i.f.

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